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SCOTT (W. D.). **Pentachlorphenol for wood preservation.**—Abs. in *Timb. Tr. J.*, clvii, 3379, p. 274, 1941.

This is an abridgement of the author's paper intended for presentation at the Zürich Timber Convention, which was abandoned owing to the European situation. Santobrite (sodium pentachlorphenate) is stated to be now widely used in the sawmills of the United States, Canada, and Scandinavia for the control of blue-staining [including *Ceratostomella* spp.] and other fungi [*R.A.M.*, xxi, p. 59]. The chlorinated phenols have also been effectively employed in the protection of exterior mill work against stain and decay. In such cases the treating material must not impair colour and paintability, and a 5 per cent. solution of pentachlorphenate in a colourless petroleum solvent has given satisfactory results, the necessary conditions being fulfilled by Commercial Standard No. 1 Fuel Oil (U.S. Federal Specification). Decay in fence posts has also been successfully combated in the field by pressure treatment with a solution of the above-mentioned type.

HUBERT (E. E.). **Preservative treatment of timbers with permatol.**—*Timberman*, xlii, 1, pp. 17, 20, 22, 24, 26, 3 diags., 1940.

Full directions, accompanied by treating schedules, are given for the preservation of timber with permatol [*R.A.M.*, xviii, p. 285], based on the results of laboratory tests with the sap wood and heart wood of ponderosa pine [*Pinus ponderosa*] and white fir [*Abies concolor*]. Eight separate formulae, primarily for the application of the antiseptic to mill work, are given. The cost of the treatment (inclusive of labour) is estimated to range from $5 to $14 per 1,000 bd. ft.

PRESTON (N. C.). **Experiments on the control of club root of Brassicae in gardens and allotments.**—*Ann. appl. Biol.*, xxviii, 4, pp. 351–359, 1 diag., 1941.

Although none of the ten different chemicals tested at the Harper Adams Agricultural College over a period of six years gave complete protection from club root [*Plasmodiophora brassicae*: *R.A.M.*, xx, p. 507] infection, significant practical control of the disease on cabbages and cauliflower was obtained with calomel, a mercury-zinc amalgam, and brassisan, all applied to soil before planting. Mercuric chloride used

in the form of a 1/1500 solution, gave consistently better results than the other materials tested, but the three mentioned are stated to have the practical advantage over it of being relatively non-poisonous and thus especially convenient for use in gardens and allotments. The relative costs of the three mercury treatments (mercuric chloride, calomel, and mercury-zinc amalgam) were approximately in the proportion of 1, 2½, and 6, respectively.

VERONA (O.) & DE MARCHI (I.). **Verträglichkeit von Phoma betae Frank gegen Bor.** [Tolerance of boron in *Phoma betae* Frank.]—*Ann. Fac. agr. Pisa*, N.S., ii, pp. 645–654, 1939. [Abs. in *Chem. Zbl.*, cxii (ii), 24, p. 2989, 1941.]

Minute quantities of boric acid were experimentally shown to exert a stimulatory action on the development of *Phoma betae*, which was retarded or inhibited, on the other hand, by comparatively large amounts of this compound or sodium tetraborate, especially the latter. The fungus was able to grow either in fairly acid or very alkaline media. A case of antagonism between *P. betae* and *Bacillus subtilis* was observed.

LEACH (L. D.). **Seedling diseases of Sugar Beets.**—*Sug. Beet Bull.*, v, 11, pp. 98–99, 1 fig., 1941.

The most uniformly satisfactory control of damping-off of sugar-beet seedlings (*Pythium* [including *P. de Baryanum*], *Rhizoctonia* [*Corticium*] *solani*, and *Phoma* [*betae*], in California is stated to be given by seed treatment with 1 to 1½ lb. ceresan or 6 oz. new improved ceresan per 100 lb. seed. The *Pythium* rot alone will yield to treatment with 2 to 3 lb. red copper oxide per 100 lb. seed, but where either *C. solani* or *Phoma betae* is involved the organic mercury compounds are more effective. The last-named organism was found to be carried in a viable form by 19 out of 35 lots of seed of European origin, whereas 19 home-grown lots were quite free from it. Since most plantings are not made with Pacific Coast seed, little or no importance attaches to *P. betae* as an agent of seedling disease.

In 1938, and again in 1940 and 1941, another seedling disease, resembling damping-off but not amenable to seed treatment, appeared in the moist acid peat or semi-peat soils of the Delta Region, causing widespread havoc in the two last years. The name 'late black root' was suggested by the dark discoloration and shrinkage of the root cortex and hypocotyl, from which an as yet undetermined water mould has been isolated. The pathogenicity of the organism was established by soil inoculation experiments. Control may be effected by steam sterilization of infested soils, while the admixture of lime to bring about an alkaline reaction (P_H 7·4) is also helpful.

YOUNG (H. C.). **Dusting reports in Ohio.**—*Proc. Amer. Soc. Sug. Beet Technol., East U.S. & Can., 1941.* [Abs. in *Sugar*, xxxvi, 12, p. 41, 1941.]

During 1938, when beet blight [? *Cercospora beticola*] was severe in Ohio, spraying and dusting increased yields from 1½ to 3 tons per acre, sugar content from 1 to 1½ per cent., and purity from 1½ to 5 per cent.;

in 1939 the yield increases ranged from 3 to 6 tons per acre. There is considered to be little doubt that the programme is profitable even in seasons of relatively mild infection. In order to reduce the cost of treatment flour may be partially or wholly replaced by bentonite as a dust diluent, the following formula giving the most consistently satisfactory results: 14 lb. copper, 7½ lb. each of wheat or soya flour and bentonite, and 71 lb. talc (No. 23, Eastern Magnesia) [cf. *R.A.M.* xxi, p. 32], but combinations of whiting, gypsum, clays, and other talcs may also be effective. The standard schedule should comprise four applications of 25 to 35 lb. dust per acre.

GLASSCOCK (H. H.). **Varietal susceptibility of Peas to marsh spot.**—*Ann. appl. Biol.*, xxviii, 4, pp. 316–324, 1941.

In varietal resistance trials carried out at Wye, Kent, during 1933 and 1934, the following commercial pea varieties remained free from marsh spot [*R.A.M.*, xix, p. 323]: Captain Cuttle, English Wonder, Fenland Wonder, Gladiator, Superb, Witham Wonder, American Wonder, Pride of the Market, Kelvedon Wonder, and Union Jack. Less marsh spot developed, however, at Wye than on many soils in Romney Marsh and East Anglia, and therefore, though the trials are a guide to relative susceptibility, the results are insufficient to establish the immunity of any given variety. Data obtained by a large firm of seedsmen from an area very prone to marsh spot for the seasons 1926 to 1933 were compared with the results of plot trials at Wye, and it was concluded that the seedsmen's list roughly indicated the reactions of the varieties. The list shows the following as free from marsh spot: Union Jack, Earliest of All, Early White Seedling, First and Best, King of Serpette, Serpette, and William the Conqueror, while Peerless, Prestige, Sutton's V.C., Onward, and Giant Stride were the most susceptible. Late-maturing pea varieties with large seeds seemed to be more severely affected by marsh spot than early-maturing ones with small, round seeds.

PIPER (C. S.). **Marsh spot of Peas: a manganese deficiency disease.**—*J. agric. Sci.*, xxxi, 4, pp. 448–453, 1 pl., 1941.

In a study of marsh spot of peas [see preceding abstract], seedlings were grown in jars in water cultures to which regulated amounts of a solution of manganese sulphate were added. Plants in all series grew normally for the first five weeks, but afterwards those receiving no manganese developed severe mottling of the younger leaves, and brown lesions on the internodes on the stem and near the growing point, all growth ceasing completely within two to three weeks, before the plants reached the flowering stage. In the series receiving 5 and 10 mg. of manganese per l. of nutrient solution, the deficiency symptoms were somewhat delayed and less severe; when all the nutrient solutions in the jars were changed and the amounts of manganese replenished, new vigorous growth was temporarily produced, which again gave room to new severe symptoms and ultimate cessation of growth, only a few flowers, and hardly any pods developing. Plants receiving 20 mg. per l. made apparently normal growth throughout, giving a good yield of ripe seeds, but 33 per cent. of the seeds were severely and 24 per cent.

slightly affected with marsh spot, while 43 per cent. were healthy. Finally, plants receiving 500 mg. per l. grew vigorously, reaching a height of 162 cm., flowering freely, and giving a heavy yield of seeds (13·5 gm. per plant as compared with 10·2, 0·4, and nil in those receiving 20, 10, and 5 mg. or no manganese, respectively), none of which was defective. It is concluded from these data that marsh spot results from a partial deficiency of manganese, soils liable to induce this disease being able to supply small amounts of manganese sufficient to meet the requirements of the plant when it is growing actively, but not sufficient to enable it to build up reserves or to supply the full amount necessary at the time of seed formation.

WEIMER (J. L.). **A leaf spot of Peas (Pisum sp.) caused by Cercospora lathyrina.**—*Phytopathology*, xxxi, 11, pp. 1031–1034, 1 fig., 1941.

Early in September, 1938, and in each succeeding summer, Austrian Winter and other field and hybrid peas (*Pisum arvense* and *P. arvense* × *P. sativum*) growing under a cheese-cloth shelter at the Georgia Agricultural Experiment Station have developed a leaf spot consisting of irregularly scattered, circular to angular, cinnamon brown to mars brown or warm sepia, usually paler-centred, sometimes concentrically zonate lesions (up to 15 per sq. cm.), 1 to 5 or up to 10 mm. in diameter. The young stems, petioles, and tendrils may be similarly affected. The causal organism of the disease, a species of *Cercospora*, was identified by C. Chupp as *Cercospora lathyrina*, a pathogen of perennial sweet peas (*Lathyrus latifolius*), and the results of inoculation tests with the former on both hosts confirmed this conclusion.

WALLACE (G. B.). **Yellow Bean mosaic and notes on other Bean diseases.**—*E. Afr. agric. J.*, vii, 2, pp. 114–115, 1941.

Certain French bean [*Phaseolus vulgaris*] varieties resistant to common mosaic were imported from the United States and sown at Lyamungu, Tanganyika Territory. The resulting plants maintained their resistance to that disease, but became severely affected by a form of yellow mosaic resembling that found in America [bean virus 2: *R.A.M.*, xiii, p. 488; xix, p. 450], where, however, the varieties were only slightly susceptible to this form. It is assumed that the disease was already present in Tanganyika in one or more varieties which acted as carriers. The varieties commonly grown locally, such as Canadian Wonder, Rose Coco, and others, are apparently unaffected. Infection was severe at Lyamungu on Wisconsin Refugee, Idaho Refugee, Red Wisconsin U.1.3 and U.1.34, Great Northern U.1.1, U.1.59, U.1.81, and U.1. 123, and Robust, while Refugee U.S.1 and U.S.5 were only slightly affected. Several Virginian varieties, among others, remained healthy. Not all the characters diagnostic of the American yellow mosaic have been recognized locally but the tendency for the upper surface of some leaves to become concave is fairly constant.

During 1940 beans at Kilimanjaro showed symptoms of sun scorch when half grown. The veins of the leaflets remained green, but the tissue between became yellow and etiolated. Brown areas appeared on the yellow ones, and from a distance the plants looked yellow or brown. The plants prematurely dried up and this resulted in many unfilled pods

and small seeds with their colour undeveloped. Plants sown later were less affected. The high percentage of seeds bearing characteristic orange-coloured blisters suggested that the trouble might be partly bacterial in origin [*Bacterium medicaginis* var. *phaseolicola*: ibid., xix, p. 187].

ZAUMEYER (W. J.) & HARTER (L. L.). **Inheritance of resistance to six physiologic races of Bean rust.**—*J. agric. Res.*, lxiii, 10, pp. 599–622, 7 figs., 1941.

The results of greenhouse experiments in which the resistance of hybrids from four different crosses involving six varieties or strains of beans (*Phaseolus vulgaris*) to races 1, 2, 6, 11, 12, and 17 of bean rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: *R.A.M.*, xx, p. 555] was tested, showed that inheritance to resistance to races 1 and 2 was due to a single Mendelian factor, while other genetic factors may be involved in the resistance to races 6, 11, 12, and 17. The factor for resistance was dominant in hybrids inoculated with races 1, 2, 6, and 12, and incompletely dominant in those inoculated with races 11 and 17. A few of the F_2 progenies inoculated with race 6 showed a leaf variegation; those severely variegated were immune, while those mildly variegated were less susceptible than normal plants. It is suggested that this may be due either to a purely physiological reaction of the host and fungus or to modifying genetic factors, or to a combination of these. In the hybrids inoculated with races 11 and 12 a major gene appears to govern resistance within grades 0 to 4 and a similar one the susceptibility within grades 5 to 10. Minor modifying factors may be responsible for the variable degrees of resistance and susceptibility found within the major classes. An F_2 progeny closely related to those that were earlier inoculated with race 12 was later inoculated with the same race and exhibited a wide range of types of resistance and susceptibility not previously noted. It is thought likely that these were not recognized before because they were masked by environmental factors and appeared under conditions thus far not exactly determined. Transgressive segregation occurred in the hybrids inoculated with race 11 since a quarter of the F_2 plants were more resistant than the less susceptible parent. The F_3 progenies of plants giving an intermediate reaction inoculated with race 17 appeared resistant and segregated in a ratio of 3 resistant to 1 susceptible in an unfavourable environment, whereas under more favourable conditions they segregated in a 1 : 2 : 1 ratio, indicating that environment exercised some influence on the degree of infection in the intermediate class.

BOTTOMLEY (A[VERIL] M.). **Onion downy mildew disease.**—*Fmg S. Afr.*, xvi, 188, p. 397, 1941.

Onion downy mildew (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xix, p. 324; xx, p. 442] appeared in almost epidemic proportions in parts of Cape Province and the Transvaal in 1939, though for many years before it had been hardly noticeable in South Africa. Since 1939 infection has occurred locally only in isolated instances. Control is recommended by means of crop rotation, improved sanitary and cultural methods, fungicidal treatments, and the use of resistant varieties (such as certain Californian selections of Italian Red).

Bond (T. E. T.). **Leaf spot diseases of Lettuce and Antirrhinum.**—*Trop. Agriculturist*, xcvii, 2, pp. 62–67, 2 pl., 1941.

Lettuce leaf spot (*Septoria lactucae*) [*R.A.M.*, xx, p. 193] caused considerable damage to young plants in the author's garden in Ceylon in May, 1941, this being apparently the first record of the fungus from the island. Both the Cos and cabbage varieties were affected. Measurements of 50 pycnidia gave diameter 65 to 145 (mean 106·9±2·72) μ and ostiole diameter 15 to 40 (29·4±0·85) μ. The measurements of 50 freshly exuded spores in water were 29 to 43·5 (35·1±0·35) by 1·5 to 3 (2·3±0·04) μ.

In April, 1941, a young planting of dwarf *Antirrhinum* [? *majus*] showed leaf spot due to *Phyllosticta antirrhini* [ibid., xx, p. 581], also a new record for Ceylon. Diameters of 20 pycnidia ranged from 90 to 150 (mean 115·5±3·21) μ, those of the ostioles measuring 20 to 30 (24·8± 0·98) μ. Measurement of 50 spores in water gave 4 to 6 (4·7±0·07) by 1·5 to 2·5 (1·9±0·04) μ. The presence of pycnidia on the capsules and on old flower stalks suggests seed infection or infection from parts of these organs present as impurities on the seed. The affected plants were grown from freshly imported seed, none of which was available for examination.

Lambert (E. B.). **Indoor composting for Mushroom culture.**—*Circ. U.S. Dep. Agric.* 609, 15 pp., 3 figs., 1 graph, 1941.

In experiments started at Arlington Farm, Virginia, in 1938 [*R.A.M.*, xx, p. 511], successful mushroom [*Psalliota*] crops were obtained by converting fresh manure into composts by means of fermentation in beds or trays under controlled conditions indoors. Fresh stable manure was chopped in a silage cutter, wetted down to contain about 250 per cent of the dry weight of water, and mixed with 10 to 30 per cent. soil and 2 per cent. superphosphate or 1 per cent. gypsum, all in one operation. It was then immediately taken indoors to prevent souring and placed in beds in the six experimental rooms of 48 plots each, at the rate of 150 lb. per 10 sq. ft. of bed space. The temperature was kept constant by thermostatic control on the optimum level of between 120° and 140° F., regulating the fluctuations within the compost by cooling or warming the surrounding air to remain within a 10° range inside these limits. Water was added to the beds on the third and fifth and again after eight or ten days of composting, thus maintaining a moisture content of about 180 to 200 per cent. Under the experimental conditions the most satisfactory length of composting was 12 days, but when less fresh manure is used, the period might be shortened. At the end of the composting period the manure should be friable, dark brown, speckled with grey fire-fang, free from ammonia odour, and the average P_H should be less than 8·0. Generally, no fungous weeds occurred during composting; all cases of infestation could be traced to deliberate under-composting or overheating. After the compost cooled and the rooms were opened, the usual control measures were observed. The quality of the resulting crop was the same as from beds composted in the conventional manner, and the yield per sq. ft. of bed space averaged from 1½ to 2¼ lb. (or on the basis of raw material, 300 to 400 lb. per ton of fresh manure).

It is suggested that indoor composting has distinct advantages over pure culture tests or outdoor composting as a method for comparing manure supplements and synthetic composts, the tests being best made by holding glass jars of prepared compost at between 125° and 130° for the required number of days, followed by inoculation with spawn and incubation at 70°. Detailed instructions are given for indoor composting by commercial growers, special attention being drawn to the following points. Each ton of manure should be mixed with 20 lb. superphosphate, 20 lb. gypsum, and about 150 lb. soil, wetted freely and broken up. When a short preliminary fermentation has been given the manure should be carried into the house immediately after the final turning and filled at the rate of one ton of wet manure to 150 to 200 sq. ft. of bed space. In order to maintain the temperature inside the beds at between 120° and 135°, the air temperature should be regulated approximately at 90° on the first day, raising it by about 5° on every following day till it reaches 125° to 130° on the eighth day after filling, the application of artificial heat being advisable only during the last few days of composting. The appearance of the composted manure, its P_H value, and the absence of ammonia odour should serve to indicate the termination of the composting period, and after composting, the usual procedure should be adopted for spawning, casing, and disease and pest control.

JENNY (J.). **Stationäre Spritzanlage im Tessin.** [The stationary spraying installation in Ticino.]—*Schweiz. Z. Obst- u. Weinb.*, l, 24, pp. 477–480, 1941.

Full particulars are given of a communal motor stationary spraying installation, organized and operated by the staff of the Cantonal Agricultural College of Mezzana, Ticino, for spraying vineyards and nurseries against downy mildew [*Plasmopara viticola*: *R.A.M.*, xix, p. 515].

VEITCH (R.). **Report of the Director of Plant Industry (Research).**—Ex *Rep. Dep. Agric. Qd, 1940–1941*, pp. 5–9, 1941.

In this report [cf. *R.A.M.*, xx, p. 151] the author states that conclusive evidence has been obtained that pineapple crook-neck [ibid., xx, p. 152], which has been somewhat severe in certain areas of the Elimbah district of Queensland, can be prevented by very small applications to the soil of zinc sulphate and copper sulphate, though neither is completely effective by itself. A large-scale test at Elimbah showed that the presence of small amounts of zinc and copper in the fertilizer mixture did not enable any reduction to be made in the other fertilizer requirements, while it also demonstrated that, in this locality, the best control resulted when copper sulphate and zinc sulphate were used in the proportion of 2 : 1 by weight.

Promising results are now accruing in the control of pineapple black heart [loc. cit.]. Incidence is associated with disturbance of the normal ripening process, and freedom from the condition has been obtained in experimental work.

A green fruit rot of pineapples associated with a species of *Phytophthora* caused much economic loss in a large plantation in northern Queensland.

When immature bananas were inoculated in the field with *Gloeosporium musarum* [ibid., xix, p. 551], the fungus resumed activity after 5½ months' latency, producing typical anthracnose lesions as the fruit ripened. This discovery accounts for earlier failures to achieve control of anthracnose by surface disinfection during harvesting.

Periodical examination was made of bean [*Phaseolus vulgaris*] crops for seed certification purposes, and a large amount of certified seed is expected to be available.

Sulphur applications to the seed-beds were found useful against chlorosis of hoop pine [*Araucaria cunninghamii*: ibid., xx, p. 152] in nurseries; watering with acidulated water also appeared to effect some improvement.

Primera Reunión Argentina, de Agronomia, Abril, 1941. Resoluciones y resúmenes de los trabajos presentados. [First Argentine Congress of Agronomy, April, 1941. Resolutions and summaries of the transactions presented.]—150 pp., B. Aires, 1941.

Included in the section of this report dealing with phytopathology (pp. 81–89) are the following items. None of the wheat varieties actually under cultivation in the Argentine proved to be immune from loose smut (*Ustilago tritici*) in experiments carried out by J. G. Arzuaga and A. D. Montes at the Santa Catalina Phytotechnical Institute in 1939, and the number showing resistance (under 10 per cent. infection) was also relatively small. The necessity of breeding varieties with an improved capacity for withstanding this disease is thus apparent [see below, p. 187].

J. Vallega found none of the varieties of oats tested resistant to all four physiologic races of *Puccinia coronata* occurring in the Argentine, but considerable interest attaches to the selection I.E.I.A. 37·24/629 from the Santa Fe Agricultural Experiment Station, which is resistant to 1, 55, and 56, though susceptible to 45, and further to Bond and its hybrids, resistant to 1 and 56, and to Victoria and its hybrids, resistant to 1 and 45. By means of crossing I.E.I.A. 37·24/629 with Victoria or one of its hybrids, e.g., Klein Mar, resistant to race 45, it is hoped to develop selections of oats resistant to all the races of *P. coronata* existing in the country. Races 55 and 56, isolated for the first time, are both highly pathogenic to Victoria, the former also to Bond but not to Ruakura, and the latter to Ruakura but not to Bond. Race 1, predominating in Canada, the United States, and Mexico, is likewise widespread throughout the cereal-growing region of the Argentine; the other three, though more virulent, are of relatively infrequent occurrence.

From samples of Khapli wheat from Peru, bearing uredosori of *P. graminis*, J. Vallega isolated a new physiologic race of the rust, designated No. 189 and believed to be the most virulent yet discovered and the only one capable of attacking all the differential varieties. Its presence in Peru explains the difficulty of finding resistant varieties in that country, where *P. graminis* is a limiting factor in the coastal districts and Khapli is one of the few sorts adapted to local cultivation.

J. B. Marchionatto found that three physiologic races of *Penicillium viridicatum* (identified by C. Thom) are implicated in the development

of 'mould' in stored maize, which is rendered useless by this defect either for seed or consumption, changes in the chemical composition inducing toxicity to livestock. So common has this trouble become that a maximum of 0·5 to 3 per cent. infection (depending on the climatic conditions of a given season) is allowed by the trade.

Phytophthora boehmeriae [*R.A.M.*, xv, p. 58] was determined by C. M. Tucker as the agent of a brown rot of sweet oranges, apparently a new host of the pathogen, investigated by M. J. Frezzi. Inoculation experiments on orange and lemon fruits gave positive results. An intensive study on 'gummy blight' of the branches and gummosis of the trunks of lemons in the Paraná Delta, conducted by H. Speroni, revealed *P. citrophthora* [see below, p. 195] as the causal organism, experiments in the prevention and control of which, covering a period of 3½ years, are stated to have given very encouraging results.

A species of *Phomopsis* was found by Clotilde Jauch to be responsible for a disease of peaches and almonds along the coast characterized by the formation on the twigs of sunken, well-defined lesions, light brown or greyish, 1 to 4 by ½ to 1½ cm. on the former host, ashen-coloured with dark reddish-chestnut borders, ½ to 2½ by ½ to 1 cm. on the latter, and mostly situated near the buds, on the internodes, and at the site of insertion of the branches, which are often killed by the penetration of the mycelium into the cambium. Abundant fructifications of the fungus were produced on steam-sterilized peach and almond twigs. In inoculation experiments the heaviest infection developed on twigs injured aseptically, somewhat less on those wounded by pulling off the leaves, and least on the ones left intact, the percentages thus obtained at a temperature of 17° to 24° C. and a relative humidity of 85 to 95 per cent. being 75, 62, and 23, respectively. The incubation period lasts for 10 to 20 days. Infection spreads most actively in debilitated orchards during periods of heavy rainfall. The shallower and more compact the soil, the more intense is the attack of the pathogen on peaches grafted on free stocks (the common mode in coastal areas); in plantings where Croose and Mussel plums, imported from Holland, served as stocks, the disease did not develop.

The same worker observed *Mycosphaerella pinodes* in epidemic form on peas [ibid., xxi, p. 127] throughout the humid districts of the Argentine, affecting not only the leaves, shoots, pods, roots, and seeds, but even the petals, sepals, and floral peduncles. In potato glucose agar cultures at 9°, 25°, and 31·5°, the rate of development of *M. pinodes* was compared with that of two other common parasites of the same host, *A*[*scochyta*] *pinodella* and *A. pisi*, and found to assume an intermediate position, *A. pinodella* making the most rapid growth and *A. pisi* the slowest. The results of seed treatment tests indicated that the most promising preparations are dusts with a mercury base, e.g. mercurisan and abavit, followed by such copper-containing products as ibis and copper carbonate. Spraying with 1 per cent. Bordeaux mixture plus an adhesive increases the yield and improves the condition of the seed, but, owing to the repeated number of applications necessary, this method of control is uneconomic. Fortnightly sowings were made in 1940 at a quarantine station to determine the effect of the planting date on the incidence of *M. pinodes* on six varieties. The best yields

were obtained from sowings made between 1st June and 15th September, those of earlier dates being severely attacked by the fungus and the later ones in general developing very poorly.

Elisa Hirschhorn's studies on *Urocystis* at the Spegazzini Institute of Botany, La Plata, have led to the transference of *U. americana* (Speg.) De Toni to *U. occulta* (Wallr.) Rabenh. and of *U. andina* (Speg.) Cif. to *U. anemones* (Pers.) Wint. [ibid., xvii, p. 181]. The proposed substitution of *Tuburcinia* for *Urocystis* is not approved [ibid., xx, p. 598].

ELROD (R. P.). **Serological studies of the Erwineae. I. Erwinia amylovora.**—*Bot. Gaz.*, ciii, 1, pp. 123–131, 1941.

An abstract of this paper has already been noticed from another source [*R.A.M.*, xx, p. 212].

LINK (G. K. K.) & EGGERS (VIRGINIA). **Hyperauxiny in crown gall of Tomato.**—*Bot. Gaz.*, ciii, 1, pp. 87–106, 1 fig., 1941.

A detailed account is given of a study on the extraction of auxins from non-inoculated hypocotyls of tomato and from hypocotyls of comparable plants bearing crown galls produced by inoculation with *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xix, pp. 202, 560].

Preliminary experiments indicated that frozen vacuum dried tomato material does not yield auxins to dry ether, the free auxin being apparently fixed until free water liberates it. Wet ether gave the best results as an extractant, but even after 17 successive extractions lasting 209 days, the process of auxin liberation was not completed. Material boiled before extraction yielded all its free auxin in one extraction by soxhletization with wet ether for 24 hours.

Comparative assays of the auxin content of uninoculated and inoculated hypocotyls 20, 22, 26, and 29 days after inoculation showed that for each pair the gall extracts gave a conspicuously higher assay than the extracts of the uninoculated hypocotyl, the ratios of difference ranging from 1 : 5·4 to 1 : 15 for the various dates.

Inoculated and uninoculated samples were next subjected to 17 successive extractions with wet ether during a period of 209 days. On every occasion the gall-bearing hypocotyl gave a higher auxin assay than the healthy hypocotyl. The amount of difference varied, and was greatest after the third extraction. The total units of auxinic activity of the extracts from the uninoculated and inoculated hypocotyls were 379 and 1,866, respectively.

In short extractions with wet ether the uninoculated material gave yields of 0, 0, and 10 units in 5, 20, and 60 minutes, respectively, while the inoculated gave 98, 132, and 145 units, respectively. With water as extractant (24 hours at 2°) the uninoculated and inoculated hypocotyls yielded 38 and 188 units, respectively. Neither the uninoculated nor the inoculated hypocotyls yielded any active extract by soxhletization. With continuous ether extraction the uninoculated material gave no measurable amount, and the inoculated 90 units.

A preliminary test showed that tomato auxin was not destroyed by boiling in water but that boiling destroyed either the agent by which, or the substance from which, potential auxin is liberated or both.

Further experimental evidence indicated that boiling destroyed the enzyme which liberated auxin rather than the precursor, and that a proteolytic enzyme can liberate auxins from the cell constituents of higher plants. The data obtained indicate that the gall at any moment contains a relatively large amount of free auxin which is liberated rapidly in extraction, but that auxin formation from its precursor proceeds slowly and at a decreasing rate.

From these studies it is concluded that extracts of the gall-bearing hypocotyls give higher free and potential auxin assays than extracts of healthy hypocotyls. This holds for all pairs of samples tested and for all extractants and methods of extraction used.

DILLON WESTON (W. A. R.). **Prevention of disease in corn crops.**—*J. Minist. Agric.*, xlviii, 3, pp. 176–180, 1941.

Brief, practical notes are given on the disinfection of wheat, oats, and barley seed-grain by means of organic mercurial dusts [cf. *R.A.M.*, xx, p. 9].

GIORDANO (H. J.). **El Trigo Sinvalocho M.A. (Sin Rival × 38 M.A.—No. 32 Rafaela).** [The Wheat Sinvalocho M.A. (Sin Rival × 38 M.A.—No. 32 Rafaela).]—*'Granos' Semilla Selecta, B. Aires*, iii, 10, pp. 3–16, 2 pl., 1939. [Received 1941.]

A full account is given of the characteristics of the Sinvalocho M.A. wheat variety, a hybrid between Sin Rival and 38 M.A. from the Rafaela Experiment Station, including its reactions to the principal diseases affecting the crop in the northern cereal-growing districts of the Argentine, viz., brown, black, and yellow rusts (*Puccinia triticina*, *P. graminis*, and *P. glumarum*) [*R.A.M.*, xx, p. 9; xxi, p. 133] and loose smut (*Ustilago tritici*). The hybrid is equal or superior to 38 M.A. in resistance to *P. graminis* and *P. triticina*, its very early maturity (6 to 10 days before 38 M.A.) assisting in its escape from the former. It has further inherited from 38 M.A. immunity from *U. tritici*, but is somewhat susceptible to *P. glumarum*.

KLEIN (E.). **Tres nuevas variedades culturales de Trigo.** [Three new cultivated Wheat varieties.]—*Rev. argent. Agron.*, viii, 2, pp. 154–160, 1941.

Particulars are given of the characteristics of three wheat varieties newly developed by the writer at the Plá (Buenos Aires) Plant Breeding Station, viz., Klein 157, Klein Exito, and Klein Alberti, all of which are resistant to the black, brown, and yellow rusts (*Puccinia graminis*, *P. triticina*, and *P. glumarum*) and loose smut [*Ustilago tritici*: see preceding abstract], and the first-named also to *Septoria tritici* and *S. nodorum*.

VALLEGA (J.). **Especialización fisiológica de Puccinia graminis tritici en la Argentina, Chile y Uruguay.** [Physiologic specialization of *Puccinia graminis tritici* in the Argentine, Chile, and Uruguay.]—*Rev. argent. Agron.*, vii, 3, pp. 196–220, 1940. [English summary.]

Seven physiologic races of *Puccinia graminis tritici* were identified at University Farm, St. Paul, Minnesota, by Stakman and Levine's

method [*R.A.M.*, ii, p. 158] from collections made in the Argentine [see preceding abstracts], Chile, and Uruguay, viz., 11, 14, 15, 17, 21, 36, and 42, of which 17 and 42 were the most prevalent and widespread in the Argentine and 17 in Uruguay, while in Chile 15 was generally distributed and 14, 17, and 11 predominated in the north, central regions, and south, respectively. Races 11 and 15 also occurred in the Argentine and 42, 36, and 21 in Uruguay. All the races except 36 were found to be highly pathogenic to durum wheats, and all except 21 attacked einkorn (*Triticum monococcum*); the Vernal and Khapli varieties proved susceptible only to 15 and 42. The last-named race has previously been reported from Egypt, India, and possibly occurs also in Abyssinia [ibid., xvii, p. 732], but not in North America, where all the others listed are present. Particular interest attaches to race 42 on account of its capacity for the infection of Khapli under strong illumination; although this variety has hitherto been resistant in the field, adult plants are susceptible in the greenhouse and may well react similarly in the open given favourable conditions.

The relationship of barberries to the origin and perpetuation of black rust of wheat in Argentina has not been fully investigated, neither is it known whether viable spores are blown from North to South America and vice versa.

The results of inoculation experiments with the physiologic races under discussion on 160 wheat varieties showed that the great majority of those grown in the Argentine and Chile are susceptible to all seven, the following constituting partial exceptions: Kanred is resistant to 17, 42, 21, and 14; Barrukan resistant to 17 and 14 and moderately so to 11; Guatraché and Utrakan resistant to 14 and 21; Bonaerense and Húngaro moderately resistant to 15; and Mentana slightly susceptible to 15 and highly resistant to 42. Among the foreign varieties, Kowar, Pilot, Rival, and Vesta showed resistance to races 11, 14, 17, and 42, Mercury and Merit to 11, 14, 36, and 42; Webster was moderately susceptible to all seven, and two Kenya hybrids were resistant to 11, 14, and 17. A high degree of resistance to the predominant Argentinian races, 42, 17, and 11, was further exhibited by several hybrids of Heines Kolben [Club]×38 M.A. developed at the Santa Catalina Phytotechnical Institute.

Fahmi (T.). **A technical method of selecting Wheat resisting black rust (Puccinia graminis).**—*Egypt. agric. Rev.*, xix, pp. 184–192, 1941. [Arabic. Abs. in *Plant Breed. Abstr.*, xii, 1, p. 42, 1942.]

Uredospores of *Puccinia graminis* are collected and maintained in an active state by the injection of spore suspensions into susceptible varieties, which are sown once a week, inoculated just before flowering, and kept under conditions favouring the spread of the rust. Before the normal date of sowing, seed of susceptible varieties is sown in rows, and the resultant plants inoculated with the activated spores in such a way as to insure the rapid and uniform spread of infection, the dead plants being replaced by new ones, which are immediately inoculated, to preserve a high degree of virulence in the field. At the normal time of sowing, single plants of the stock under selection are interplanted among the contaminated rows. The progress of the disease is recorded

weekly, and individual plants combining resistance with other desirable characters are selected and bred for several generations under the same conditions until the requisite qualities become fixed. This method is only adapted for use under conditions conducive to the early dissemination of *P. graminis*.

Humphrey (H. B.). **Climate and plant diseases.**—*Yearb. Agric. U.S. Dep. Agric., 1941*, pp. 499–502, 1941.

In this paper the author briefly discusses the influence of weather conditions in inducing epidemics of plant diseases. He points out that in 1915 the spring wheat crop in the United States reached a total of 368,000,000 bush., with an average yield of 17·8 bush. per acre, but in 1916 the corresponding figures dropped to 178,000,000 and 9·2 bush. per acre, the difference of nearly 200,000,000 bush. being due mainly to a rust [*Puccinia graminis*] epidemic, made possible by one month's warm, moist weather in July, 1916. While weather conditions remain unalterable, the amount of inoculum present and the acreage of susceptible hosts can be reduced by growing resistant varieties, thus offsetting the effects of climate. A new rust-resistant wheat developed in Texas by co-operative research is expected shortly to be distributed, to eliminate overwintering infections in southern areas. This will not only protect the Texas wheat crop, but will cut off inoculum from susceptible varieties grown to the north and east [*R.A.M.*, xviii, p. 239 *et passim*].

Platt (A. W.), Darroch (J. G.), & Kemp (H. J.). **The inheritance of solid stem and certain other characters in crosses between varieties of Triticum vulgare.**—*Sci. Agric.*, xxii, 4, pp. 216–224, 1 graph, 1941.

The inheritance of stem solidness, stem rust (*Puccinia graminis tritici*) reaction, awning, and glume colour was studied in segregating generations of crosses involving Renown and Thatcher as hollow-stemmed, stem rust-resistant, awnletted, white-chaffed parents, and S–615–9 and S–615–11 as solid-stemmed, stem rust-susceptible, awned, brown-chaffed, and S–633–3 and S–633–23 as solid-stemmed, stem rust-susceptible, awnletted, white-chaffed parents.

The evidence suggested that stem rust reaction was governed by a dominant factor for resistance and an inhibitor in the crosses Thatcher and S–615–11, Renown×S–615–9, and Renown×S–633–3. Several factors appeared to participate in the cross Thatcher×S–633–23, only one resistant F_3 line in 467 being found. Stem rust reaction and glume colour were not associated with stem solidness.

Johnson (T.) & Newton (Margaret). **The predominance of race 56 in relation to the stem-rust resistance of Ceres Wheat.**—*Sci. Agric.*, xxii, 3, pp. 152–156, 1941.

Observations and experiments made to ascertain whether Ceres wheat in Canada was more resistant to stem rust (*Puccinia graminis tritici*) before 1935, when race 56 became predominant in the Great Plains regions, than it has been since [*R.A.M.*, xvii, p. 381], and whether it is less resistant to this race than to others, which were previously more prevalent, showed that race 56 is in fact more pathogenic to this

variety than races 21, 34, 36, 38, and 49, which were the chief components of stem rust epidemics in western Canada when Ceres wheat was seldom seriously attacked. Little doubt can be entertained that the predominance of race 56 since 1935 is a factor responsible for the more severe rust observed on Ceres in recent years. The disappearance of this variety as an economically important wheat was not solely due to the predominance of race 56 but also to the production of wheat varieties possessing greater resistance than Ceres. But the case illustrates the impairment of the productive value of a widely grown wheat variety by the ascendancy of a new physiologic race of stem rust and the possibility of similar occurrences must be faced in the future.

Demyanovitch (N. I.). Итоги работы Льговской опытноселекционной станции по выведению устойчивых сортов озимой Пшеницы. [The results of work at the Ljgoff Experimental Selection Station on breeding resistant varieties of winter Wheat.]—*Научн. Зап. по Сахарн. Пром.* [*Sci. Notes Sug. Ind.*], *Kieff*, [Grey Ser.], xvi, 2–3, pp. 92–100, 1939.

In varietal trials of the resistance of winter wheats to brown rust (*Puccinia triticina*) [*R.A.M.*, xx, p. 455] and bunt (*Tilletia tritici*) [*T. caries*: ibid., xviii, p. 447] conducted from 1934 to 1937 at the Ljgoff experimental Selection Station [Central U.S.S.R., Kursk district], the following varieties showed the greatest promise: Bear 11×21/64 was resistant to *P. triticina* (showing from 0·0 to 21·5 per cent. infection) and a good yielder, but was susceptible to *T. caries* (8·6 to 53·1 per cent. infection); Zarya×599 combined resistance to brown rust with resistance to bunt; the crosses 1188×074, 407×237, 246×348 gave high yields, were hardy and resistant to rust and some lines among the progenies of the two first crosses were also resistant to bunt; and the cross 332×294 was highly resistant to bunt in all stages of the selection process. Of the latest crosses the following are held to be the most promising: (Bear 11×21/64)×599; (332×294)×6–86; (332×294)×074; and also some crosses between the best varieties of this station with those of others.

Holton (C. S.) & Heald (F. D.). **Bunt or stinking smut of Wheat (a world problem).**—ii+211 pp., 20 figs., 1 graph, Minneapolis, Minn., Burgess Publishing Co., 1941. $3·25 (payable in U.S. Funds) post free.

The writers' object in the compilation of this treatise was to present in a single publication the principal available information on various aspects of the wheat bunt (*Tilletia tritici* and *T. levis*, or strictly according to the International Rules of Botanical Nomenclature, *T. caries* and *T. foetida*) problem. The work is divided into eleven chapters, each followed by a bibliography of the relevant literature, namely, (I) introduction; (II) economic importance of bunt; (III) species distinction, spore germination, and artificial culturing of the bunt fungi; (IV) host range of the bunt fungi and other species of *Tilletia* affecting wheat or other cereals; (V) factors affecting infection by the bunt fungi and their development in the host; (VI) effect of bunt on the morphology and physiology of the wheat plant; (VII) physiologic specializa-

tion in the bunt fungi; (VIII) cytology of the bunt fungi; (IX) heterothallism, hybridization, and species association in *T. caries* and *T. foetida*; (X) varietal reaction and the genetics of resistance to bunt; (XI) seed treatment and cultural practices for bunt control. Many of the more recent papers cited have been noticed from time to time in this *Review*.

Sabourova (Mme P. V.). **Physiologische Besonderheiten bei der Bildung der an Ustilago tritici erkrankten Weizenähre.** [Physiological peculiarities in the development of Wheat ears infected with *Ustilago tritici*.]—*C. R. Acad. Sci. U.R.S.S.*, N.S., xxviii, 3, pp. 270–273, 1940.

In a study with vernalized wheat of the varieties Albosar and Albidum artificially infected with *Ustilago tritici* [*R.A.M.*, xix, p. 398] it was found that suction pressure ['Saugkraft'] in a diseased ear did not differ from that in a healthy one till the third and fourth nodes were formed, when it was, respectively, 1·90 and 4·36 atmospheres lower in the variety Albosar, and 0 and 4·89 in Albidum. Since all other conditioning factors were the same in both ears, the difference in suction pressure is explained on the basis of a possibly lower concentration of osmotically active substances in diseased ears. This is probably connected with the nutritional exhaustion of the plant caused by the fungus. The osmotic pressure was found to be slightly higher in healthy ears than in diseased ones. Thus, in the third-node phase the osmotic pressure in healthy Albosar and Albidum ears was 10·06 and 9·76 atmospheres, respectively, as compared with 8·79 and 8·53 in diseased ears; in the fourth-node phase the corresponding figures were 11·32 and 10·98 as compared with 7·55 and 7·32, respectively. It was observed that at concentrations at which the cells of the host plant were already showing plasmolysis, the mycelium of the fungus within these cells showed none and it is concluded that the osmotic concentration is higher in the mycelium than in the cells of the host plant. The water content of diseased ears in both wheat varieties was lower than that of healthy ones (namely, 629·64 and 579·86 per cent. of the dry weight, respectively, in healthy Albosar and Albidum, both fifth-node stage, as compared with 449·81 and 325·30 in the diseased). There appeared to be no noticeable difference in the P_H values of the diseased or healthy ears or the mycelium of the fungus.

Gorlenko (M. V.). **Neue Befunde über die Biologie von Erysiphe graminis tritici March.** [New results concerning the biology of *Erysiphe graminis tritici* March.] —*C. R. Acad. Sci. U.R.S.S.*, N.S., xxvii, 8, pp. 866–870, 3 figs., 1940.

Field observations and studies initiated in 1938 at the Voronezh Plant Protection Station showed that *Erysiphe graminis tritici* overwinters on the lower leaves of winter wheat in the form of dense, brown mycelial mats. In the following spring conidia develop on these mats, and new, smaller and often almost white pustules soon appear, first in the proximity of the old mats, then on the adjoining leaves of the same plant, later to spread to neighbouring plants. The possibility of summer infection through perithecia overwintering on the remains of last year's

harvest was investigated, but counts showed that whereas only 1 to 2 per cent. of diseased plants developed in the vicinity of such remains, 23 to 28 per cent. developed next to stands of winter wheat. It is concluded, therefore, that stubble and crop debris do not constitute an important source of infection in summer wheat. The life-cycle of the fungus in the Voronezh district appears to run through the following stages: (1) maturation of the ascospores (August, September, and October); (2) infection of winter wheat through the ascospores (September and October) followed by the overwintering of the fungus on winter wheat in form of mycelial mats; (3) the development of the disease on winter wheat (April and May); (4) spread of the disease to summer wheat; (5) the formation of perithecia on the winter and the summer wheats (second half of May and first half of June, respectively); (6) further development of the fungus on summer wheat; and (7) the dormancy of the ascigerous stage on harvest remains (late July, August, September). It thus appears that, contrary to previous assumptions, the hardy ascigerous stage does not constitute an important mode of overwintering for the fungus [cf. *R.A.M.*, xvii, p. 306] but provides a means for ensuring the infection of winter wheat in the late autumn.

Fellows (H.). **Effect of certain environmental conditions on the prevalence of Ophiobolus graminis in the soil.**—*J. agric. Res.*, lxiii, 12, pp. 715–726, 3 graphs, 1941.

In studies at the Kansas Agricultural Experiment Station *Ophiobolus graminis* grown in pure culture on potato dextrose agar and exposed to the winter cold of 1925–6 and 1926–7 remained viable, surviving a temperature as low as —2° F. When cultures of the fungus were subjected to repeated alternations of temperature ranging from 70° to —20°, viability was also unaffected. The micro- and macro-hyphae were killed by exposure to 122° (50° C.) for 10 minutes, but the fungus remained viable after 10, 20, and 30 minutes' exposure to a temperature of 113° F. (45° C.).

In naturally infected soil [*R.A.M.*, xviii, p. 585] the fungus survived a temperature of 160° F. (71° C.). In experiments on the effect of summer heat and drought on the fungus in soil the relative abundance of the fungus in the upper soil layers was compared with that in the deeper layers less subject to heat and drought. It was found that high temperatures and drought in summer only slightly reduced the infestation in infested soils. In another experiment the abundance of the fungus in infected soils was not reduced by repeated alternations from growing to sub-freezing temperature.

Different combinations of moisture, temperature, and compactness of the soil during storage reduced infestation to a varying extent, but viability persisted in either moist or dry infested soil kept in a warm greenhouse for 777 days. Under the condition of the experiments the storage temperature of the infested soil had more effect on the viability of *O. graminis* than any other factor, a cool temperature favouring the fungus regardless of other factors. Both moisture and compactness modified the effect of temperature on the prevalence of the fungus; when the soil was cool and loose, moisture was of little importance but the addition of moisture to warm soil, and especially a loose one, tended

to rid the soil of the fungus. Infestation did not increase under any conditions of storage but was reduced most in a warm, loose, moist soil, and least in a cool, compact, moist one.

MacLachlan (J. D.). **Manganese deficiency in soils and crops. I. Control in Oats by spraying; studies of the role of soil micro-organisms.**—*Sci. Agric.*, xxii, 3, pp. 201–207, 2 pl., 1941.

Oats sown in a field in Ontario, in a well-defined area of which oats and barley failed to reach normal maturity, developed chlorotic symptoms and stunting within about a month. Plots within the affected area were sprayed with $\frac{1}{4}$, $\frac{1}{2}$, 1, and 2 per cent. solutions of borax, zinc sulphate, iron sulphate, and manganese sulphate, and within ten days all plots sprayed with the last-named had resumed the normal colour, whereas the other applications induced no response. Comparative tests showed that a single spray application of 1 per cent. manganese sulphate four to eight weeks after sowing was more effective than soil applications of 140 or 280 lb. per acre applied to the sowing drill, the former yielding a grain weight (expressed as a percentage of the above-ground parts) of from 19·6 to 23·2 (23·6 when bentonite and soap were added to the spray) and the latter only 12·2 and 19·1, respectively.

The possibility that soil bacteria were a factor in the manganese deficiency was investigated, utilizing the technique of Gerretsen [*R.A.M.*, xv, p. 356].

Bacteria isolated from the soil of the affected areas in question actively converted manganese sulphate to the oxide form *in vitro*, and it would appear that this soil contains an excess of bacteria which contribute to manganese oxidation, reducing the level of available manganese below the minimum requirements for the normal development of oats. Bacteria capable of oxidizing manganese were also isolated from the adjacent soil carrying a normal oat crop but they were fewer in number and insufficient to upset the balance of the microflora whereby sufficient manganese is available for normal development.

Sherman (G. D.) & Harmer (P. M.). **Manganese deficiency of Oats on alkaline organic soils.**—*J. Amer. Soc. Agron.*, xxxiii, 12, pp. 1080–1092, 5 figs., 1941.

Wolverine, Iogold, and Gopher oats, grown in the greenhouse at the Michigan Agricultural Experiment Station on alkaline organic soil (P_H 7·4 to 7·8) and receiving weekly applications of sodium nitrate in addition to a 0–8–24 mineral fertilizer at the rate of 500 lb. per acre, developed severe symptoms of grey speck, the Huron variety sustaining relatively slight damage under identical conditions. Further studies were conducted mainly on the first-named highly susceptible variety, on which the following stages in the breakdown were recognized. A faintly greyish lesion develops, generally about half-way along the leaf, gradually becoming more pronounced until, after a few days, the upper part of the leaf breaks over at a sharp angle. The greyish tint gives way to a round or oval, bright yellow colour, with a reddish fringe encircling the periphery of the lesion and imparting a halo effect, the grey shade in the meantime extending outwards into fresh tissue. The death of all

the basal tissue is followed, but not for some time, by that of the leaf tip. Hot, dry weather, however, may stimulate the formation of new leaves and a certain amount of seed production. A cool season favours the grey speck stage of the disease, while at higher temperatures the halo phase predominates. Grey speck (of which this is the first record in the United States) has also been observed on occasional high-lime mineral soils in the State.

The most practical method of combating the disease on an alkaline organic soil consists in the application of manganese sulphate [*R.A.M.*, xx, p. 459 and cf. preceding abstract] at the rate of 100 to 400 lb. per acre or of sulphur in amounts sufficient to reduce the P_H value to a point somewhat below P_H 7·0. Experimentally, grey speck was found to be controllable by the incorporation with the soil of any manganous salt or permanganate, sulphur, sulphuric acid, hydroquinone, creatinin, haemoglobin, or stannous chloride. The data obtained in these tests strongly indicate that any treatment increasing the exchangeable manganese in the soil to upwards of 3 p.p.m. will prevent the development of grey speck, a process that can be accomplished either by the addition of soluble manganese or by the reduction of manganic to manganous manganese by chemical means.

Kernkamp (M. F.) & Martin (W. J.). **The pathogenicity of paired haploid lines of Ustilago zeae versus the pathogenicity of numerous mixed haploids.**—*Phytopathology*, xxxi, 11, pp. 1051–1053, 1941.

In comparative inoculation experiments on Northwestern Dent maize seedlings at the Minnesota Agricultural Experiment Station with single pairs of haploid lines of *Ustilago zeae* and bulk inoculum comprising all the haploid lines used in the single pairs, the virulence of the former ranged from 0 fleck to 4+, while that of the latter was computed at 2—. All inoculations were made by injecting potato-dextrose broth suspensions of the haploid lines into the plants. In another test, in which measured quantities of inoculum were used in the single pairs and the composite inoculum contained equal proportions of each haploid line, two series of inoculations were made, one consisting of four single highly virulent pairs and the composite of these four combinations, and the other of four pairs ranging from relatively low to high virulence and the composite of those lines. The virulence of the composite inoculum in each series approached that of the single pairs in each series. Similarly, the reaction of the composite of all the lines in both series was intermediate between the reactions of the composites of both series. These results are taken to indicate that the dilution of lines in bulk inoculum is not the explanation of the relatively low degree of virulence of such infective material. Further experiments showed that the presence of a weakly pathogenic pair inoculated into maize seedlings did not prevent the development of a highly virulent pair in subsequent inoculations, though inoculations in the reverse order gave erratic results. No evidence was obtained that one pathogenic strain might exert an antibiotic effect on another. The authors conclude from these studies that care is necessary in the classification of resistant varieties on the basis of their reaction to bulk inoculum.

Frezzi (M. J.). **La 'Phytophthora citrophthora', causante de la podredumbre del pie del Naranjo y la gomosis del tronco del Limonero, en Corrientes.** [*Phytophthora citrophthora*, causing foot rot of Orange and trunk gummosis of Lemon in Corrientes.]—*Rev. argent. Agron.*, vii, 3, pp. 165–171, 4 pl., 2 figs., 1940.

Phytophthora citrophthora has in general been found to be much less widespread on citrus in the Argentine than *P. parasitica* [*R.A.M.*, viii, p. 238; xx, p. 401], the latter having been isolated from over 70 cases of foot rot of sweet and sour oranges, Persian and Rangpur limes, Eureka and Genoa lemons, and tangerines, whereas the former was associated (in the main series of experiments) with only one sweet orange suffering from foot rot and one lemon affected by gummosis of the trunk (brown rot). As the paper was going to press, however, *P. citrophthora* was further isolated from one-year-old lemons grafted on sour orange stocks and showing symptoms of gummosis and necrosis at the site of insertion, as well as from sweet orange, pomelo, and lemon fruits with brown rot.

The cultural and morphological characters of *P. citrophthora* are described. Inoculation experiments with pure cultures on 1 per cent. glucose agar, introduced through cortical incisions, resulted in the formation on lemons, and to a lesser extent on oranges (10- to 15-year-old trees), of actively growing cankers exuding an abundance of honey- to amber-coloured gum.

Periodical applications to the trunk and main branches of Bordeaux paste or whitewash should prevent the onset of infection by *P. citrophthora*, while curative measures should comprise abrasion of the cankers, disinfection with 1 in 1,000 mercuric chloride, and treatment of the wounds with Bordeaux paste, tar, or a similar protective substance.

Bliss (D. E.). **Relation of Ceratostomella radicicola to rhizosis of the Date Palm.**—*Phytopathology*, xxxi, 12, pp. 1123–1129, 5 figs., 1941.

Ceratostomella radicicola having been found associated with date palm rhizosis [*R.A.M.*, xxi, p. 13] in less than half the cases investigated at the Citrus Experiment Station, California, some doubt arises as to whether this fungus is the sole factor involved in the etiology of the disease, more especially as many mature palms die suddenly with all the symptoms of rhizosis except the presence of the organism in the roots. Inoculations into wounded seedling Deglet Noor date palms with *C. radicicola*, however, caused rapid necrosis, the leaf bases, in the cells of which macrospores of the *Chalaropsis* stage of the fungus were formed, and primary roots being blackened and decayed and the mycelium and spores detected, not only in these organs, but also in the trunk and terminal bud. The fungus also proved highly pathogenic to uninjured green fruits of the same variety, which began to fall from the strands and undergo rapid decomposition on the fourth day after inoculation.

Other fungi associated with rhizosis included *Trichoderma lignorum* [*T. viride*], *Fusarium* sp., and *Rhizoctonia* [*Corticium*] *solani*.

Fickendey (E.). **Kali- und Magnesiamangel in gewissen Böden von Sumatra.** [Potash and magnesia deficiency in certain soils of Sumatra.]—*Ernähr. Pfl.*, xxxvii, 11–12, pp. 88–89, 1941.

Oil palms growing in the sandy loam soils of the alluvial plain between the Asahan and Barumum rivers on the east coast of Sumatra, with a hard layer at a depth of 0·75 to 1 m. which obstructs the downward movement of the roots, exhibit the following pathological symptoms. The pinnate leaves develop yellow spots and stripes, which expand and ultimately become confluent; instead of the taut extension of the normal foliage, the two halves of the affected leaves slope towards one another, indicating an attempt on the part of the palm to reduce transpiration, the brown to black, necrotic roots being unable to maintain the necessary supply of water. The affected leaves shrivel and die prematurely. The application to the soil of factory ash resulted in a complete cure, and similarly beneficial effects were exerted by potassium carbonate, potassium sulphate, and patent potash, especially the first-named. Potassium chloride alone was injurious to the palms but improved their condition when mixed with calcined shell lime. The leaf ash of diseased palms in a neighbouring plantation having revealed a remarkably low content of magnesia as well as of potash, potassium sulphate and calcined dolomite were applied to the soil in large-scale tests with satisfactory results.

Miller (P. R.) & Weindling (R.). **A survey of Cotton boll rot diseases and associated microorganisms in 1941.**—*Plant Dis. Reptr*, xxv, 20, pp. 518–521, 1 map, 1941. [Mimeographed.]

As in the three preceding years of the cotton boll disease survey [*R.A.M.*, xxi, p. 14], *Glomerella gossypii* was again the predominant pathogen on material collected east of Texas and Oklahoma. On the other hand, the water-soaked spots commonly attributed to *Phytomonas* [*Xanthomonas*] *malvacearum* were less prevalent than heretofore, and the percentage of such lesions yielding the causal organism was much lower than in 1940, namely 13 as compared with 41 per cent. Tables are given showing the frequency of occurrence of micro-organisms in sample lots of bolls and in cultures from individual bolls, expressed in terms of percentage in both cases.

Chester (K. S.). **The probability law in Cotton seedling disease.**—*Phytopathology*, xxxi, 12, pp. 1078–1088, 4 graphs, 1941.

At the Oklahoma Agricultural Experiment Station a mathematical analysis was made of the survival of cotton seedlings in the greenhouse and field under varying conditions of infection by *Glomerella gossypii*, *Fusarium moniliforme* [*Gibberella fujikuroi*], *Rhizoctonia* [*Corticium*] *solani*, and other seed-infesting fungi [see preceding abstract], with a view to determining the extent to which an infected plant is hazardous to those in the immediate vicinity.

Given freedom from severe infection by *C. solani*, the mortality of seedlings from diseased seed followed a random distribution, agreeing with the formula derived by expansion of the binomial equation. The absence of a skew distribution, with an excessive number of seedling failures in hills containing one or more infected seeds, is taken to

indicate that, *C. solani* being excluded, diseased seedlings do not ordinarily constitute a threat to the health of adjoining sound ones. This hypothesis was confirmed by direct observation of the success of healthy seedlings in the presence of diseased ones in soil free from *C. solani*, as well as by the equal emergence rates of seedlings from mixtures of infected and sound seed whether planted under conditions of many or few potential contacts between diseased and healthy seedlings. On the other hand, where *C. solani* was a factor, an unduly high proportion of seedling failures, attributable exclusively to this cause, was registered in hills originally containing one or more diseased seedlings. These data explain the greater utility of ceresan seed treatment in the south-eastern States, where *G. fujikuroi* and *Glomerella gossypii* are the principal agents of seedling disease, as compared with those of the south-west (Texas and Oklahoma), in which acid delinting is more successful against the predominant pathogen, *C. solani*, by curtailing the period of susceptibility of the host. In this connexion the writer emphasizes the urgent need for further development of chemical protection of cotton and legume seed against *C. solani* in the south-west, volatilization over a relatively long period being the foremost requirement in a fungicide intended for such a purpose. The observation that the infection of a given seedling does not endanger the health of those surrounding it has a bearing on the planting value of partially infested seed, which may be regarded, other factors being equal, as proportional to the results of laboratory germination tests.

Smith (A. L.). **The reaction of Cotton varieties to Fusarium wilt and root-knot nematode.**—*Phytopathology*, xxxi, 12, pp. 1099–1107, 2 figs., 1 graph, 1941.

Observations in the Coastal Plain area of Georgia in 1940 indicated an association between resistance to the root-knot nematode (*Heterodera marioni*) infestation and freedom from wilt (*Fusarium vasinfectum*) [*R.A.M.*, xix, p. 146], but the relationship appears to be casual, since some wilt-resistant varieties, e.g., Delfos 425, Dixie Triumph 06–366, and Sea Island Seabrook 31–12 B–2, show no more resistance to root knot than the wilt-susceptible and semi-resistant varieties. Resistance to *H. marioni* was confined to wilt-resistant varieties originating in the lighter types of local Coastal Plain soil in South Carolina, such as Early Wilt, Coker's 4 in 1 strain 4, and Wannamaker Cleveland, whereas the wilt-resistant types developed on the heavier soils of Mississippi and Louisiana, where root knot is a less acute problem, were all susceptible to the nematode. Plant-breeders and pathologists would be well advised to devote some attention to the selection of strains combining resistance to the nematode and fungus. In this connexion the writer describes a system for the numerical evaluation of nematode infestation in cotton plants, whereby an increasing incidence of root knot can be represented by a rising scale of numbers from 0 to 4.

Fahmi (T.). **A technical method of selection in Cotton for immunity against wilt.**—*Egypt. agric. Rev.*, xix, pp. 6–17, 1941. [Arabic. Abs. in *Plant Breed. Abstr.*, xii, 1, p. 59, 1942.]

With a view to the development of cotton strains combining

productivity and other desirable characters with immunity from wilt [*Fusarium vasinfectum*], seedlings are planted in pots containing contaminated soil, which are kept for 40 days in a greenhouse at 25° C. At the end of this period, the apparently healthy plants are set out in the field, where they are bred for several generations until the requisite qualities become firmly established. The best stock for the object of these experiments is produced by artificial hybridization between carefully selected immune and non-immune varieties.

Boughey (A. S.). **Cotton seed disinfection in war-time.**—*Nature, Lond.*, cxlix, 3767, pp. 50–51, 1942.

In an attempt to find an alternative measure for the control of blackarm disease of cotton (*Bacterium* [*Xanthomonas*] *malvacearum*) [*R.A.M.*, xx, p. 162] to mercurial dusts, a shortage of which is anticipated in war-time, cotton seed in the Sudan was steeped for 48 hours in four times its own weight of irrigation water. As a result, all traces of external infection disappeared and no infection occurred in subsequent small-scale greenhouse experiments with seed which, when untreated, gave 14 per cent. infected plants. In the field, infected seed from the same source showed 0·26 per cent. infected plants after the steeping treatment, while complete control was obtained with a mercurial dust, abavit B. The germination of the steeped seed was only slightly depressed in comparison with untreated, the germination percentages in the field being 72 and 79, respectively. If the steeped seed cannot be sown wet immediately, it should be dried rapidly and thoroughly before storing, as otherwise the seed germinates promptly. The conclusion drawn from this experiment is that the organism disappears from the surface of the seed during steeping, not through the activity of a bacteriophage, but through exposure to anaerobic conditions resulting from bacterial activity and oxygen absorption by the germinating seed.

Blanco (M. C.). **Las micosis broncopulmonares. Su importancia clinica.** [The bronchopulmonary mycoses. Their clinical importance.]—*Bol. Inst. Clín. quirúrg., B. Aires*, xvi, 137, pp. 787–930, 41 figs., 1940. [Abs. in *Trop. Dis. Bull.*, xxxviii, 12, pp. 730–731, 1941.]

The first of the 13 chapters of this important monograph deals with the history of mycoses since Malpighi's studies in the latter part of the 17th century; the second with the morphology, biology, reproduction, and classification of the fungi concerned in the etiology of these diseases, which are divided into three groups, (1) fungi with blastospores, comprising two families, Saccharomycetaceae and Torulopsidaceae, (2) fungi with astrospores, and (3) filamentous fungi, including Actinomycetaceae with slender hyphae, and Mucoraceae and Aspergillaceae with thick ones; successive chapters are devoted to pathogenesis, pathological anatomy, symptomatology, differential diagnosis, clinical forms, associated diseases, and therapy (mainly by potassium iodide). Pulmonary mycosis, at any rate in the Argentine, is by no means a rarity and its incidence is on the increase. Some of the fungi responsible are true parasites, others 'pseudoparasites' capable of assuming a

pathogenic character where the condition of the host tissues favours such a change.

Foley (M. P.), Love (J. G.), Broders (A. C.), & Heilman (F. R.). **Coccidioidal granuloma. Report of a case originating in Texas.**—*West. J. Surg.*, xlviii, 12, pp. 738–741, 5 figs., 1940.

Coccidioides immitis developed in dextrose agar cultures of material from the sinus behind the right ear and from portions from the cranial bone of a 33-year-old male on whom a successful operation was performed at the Mayo Clinic, Rochester, Minnesota, for the removal of the granuloma produced by the fungus. Attention is drawn to the two phases of *C. immitis*, namely, the parasitic, characterized by the production in the host tissues of double-contoured bodies filled with endospores, and the vegetative, on artificial media under aerobic conditions, represented by branched, septate, flocculent mycelia and chlamydospores. Stress is further laid on the close resemblance of the fungus, both in its macroscopic and microscopic features, to *Mycobacterium tuberculosis*. *C. immitis* was reisolated from the small, white, tubercle-like nodules developing in the lungs and other organs of intraperitoneally inoculated mice.

Yoh (T.). **Über die Trichophytie in Formosa. I. Mitteilung : über die Kopftrichophytie in Nordformosa.** [On trichophytosis in Formosa. Note I: on trichophytosis of the scalp in north Formosa.]—Abs. in *Jap. J. Derm. Urol.*, xlix, 2, pp. 11–12, 1941.

Microsporum ferrugineum [*R.A.M.*, xviii, p. 522] was ascertained to be the most frequent agent of superficial trichophytosis of the scalp in north Formosa, having been responsible for the condition in 293 out of 388 cases examined in the native elementary schools and among outpatients of the Taihoku University Clinic; 68 yielded *Trichophyton violaceum*, 23 *T. coccineum* [ibid., xix, p. 705], one each *T. glabrum* and *T. gypseum* var. *radiolatum*, and two unidentified strains. Of four cases of deep-seated ringworm, two were shown to be due to *M. ferrugineum* and one each to *T. coccineum* and *T. glabrum*.

T. coccineum, first recognized by Y. Kato in Kyushu, and since observed on the Japanese mainland, Korea, Formosa, and China, forms on Sabouraud's maltose agar brownish-red to purple colonies, intersected after 18 days' growth by over 30 radial and a few circular grooves. On glucose agar the cultures are of a drier and more powdery consistency, sometimes barely distinguishable from those of *T. purpureum*. Pigmentation becomes progressively fainter in subcultures, and is absent on peptone agar. Spindle spores with 2 to 6 septa were first detected by the writer. Infection by *T. coccineum* is readily communicable to guinea-pigs.

Takahashi (S.) & Yoh (T.). **Über die Trichophytie in Formosa. II. Mitteilung : über die Kopftrichophytie in Mittelformosa.** [On trichophytosis in Formosa. Note II: on trichophytosis of the scalp in central Formosa.]—Abs. in *Jap. J. Derm. Urol.*, xlix, 3, p. 23, 1941.]

As in northern Formosa [see preceding abstract], *Microsporum*

ferrugineum is the most frequent agent of superficial ringworm of the scalp in the central districts, having been identified in 583 out of 992 cultures, followed by *Trichophyton violaceum* (311), *T. coccineum* (67), and *T. glabrum* (31), while all seven cases of deep-seated ringworm were caused by *M. ferrugineum*. The admixture of favus was observed in five cases of superficial trichophytosis and double '*Trichophyton*' infections in 45. Three cases of the former yielded *M. ferrugineum* and *Achorion schoenleini*, and one *T. glabrum* and *A. formosensis* Hasegawa, while *M. ferrugineum* and *T. violaceum* were implicated in the latter.

Araki (M.). **Über das Auftreten von Weinranken in Trichophytonstämmen.** [On the development of 'vine tendrils' in *Trichophyton* strains.]—Abs. in *Jap. J. Derm. Urol.*, xlix, 2, pp. 12–13, 1941.

The writer carried out a study on the development of 'vine tendrils' (Bodin's 'vrilles') in various species of *Trichophyton* with a view to determining the mechanism of this hitherto unexplained phenomenon or the factors involved in its appearance. 'Tendril' formation is already familiar in *Sabouraudites asteroides* [*T. mentagrophytes*] and *S. interdigitalis* [*T. interdigitale*], and in the present investigations it was further observed in *Epidermophyton inguinale* [*E. floccosum*] and *S. ruber* [T. *rubrum*]. The spiral mode of growth, culminating in 'tendrils' at the hyphal tips, is tentatively attributed to the lack of sufficient available nutrient to supply the requirements of the actively growing mycelium.

Cutting (W. C.) & Gebhardt (L. P.). **Inhibitory effects of sulfonamides on cultures of Actinomyces hominis.**—*Science*, N.S., xciv, 2450, pp. 568–569, 1941.

Aerobic and anaerobic cultures of two strains of *Actinomyces hominis* [*R.A.M.*, xv, p. 650] were almost completely inhibited by sulphanilamide at concentrations of 50 and 100 mg. per cent., and partly so at one of 10 mg. per cent. At similar concentrations sulphathiazole and sulphadiazine were even more effective.

Carrera (C. J. M.). **La presencia de 'Fusarium scirpi v. acuminatum' en la República Argentina.** [The presence of *Fusarium scirpi* var. *acuminatum* in the Argentine Republic.]—*Rev. argent. Agron.*, vii, 2, pp. 89–94, 3 figs., 1941.

In October, 1938, Dr. Maria Campi isolated from carnations at Buenos Aires two species of *Fusarium*, viz., *F. equiseti* and *F. scirpi* var. *acuminatum* [*R.A.M.*, xx, pp. 246, 353], of which the latter was experimentally shown to be pathogenic to Klein 11 flax, grown in pots containing sterilized soil, superficially covered with a wheat grain culture of the fungus. The organism previously described by Bolley and Manns as *F. russianum*, and implicated by them in the etiology of flax 'sickness' in the United States [ibid., xii, p. 220], has been relegated by Wollenweber [ibid., xiv, p. 708] to synonymy with *F. scirpi* var. *acuminatum*. It was a much milder parasite in the author's experiments than *F. lini*, while *F. terrestris* Manns (since reduced to synonymy with *F. equiseti* var. *bullatum* [ibid., xix, p. 168]) was non-pathogenic. The importance of the detection of *F. scirpi* var. *acuminatum* on such apparently unrelated hosts as carnation and flax lies in the opportunity

afforded to the pathogen for multiplication in the former to the detriment of the latter.

Nelson (R. H.) & Cassil (C. C.). **Adsorption of mercuric chloride from solution by Gladiolus corms.**—*Circ. U.S. Dep. Agric.* 610, 10 pp., 1941.

Mercuric chloride is widely used by growers in the United States as a preventive of corm-borne diseases and pests of gladioli, and the experiments herein fully described and tabulated were conducted to determine, by precise chemical analysis, the amount of the chemical removed from solution by unpeeled corms immersed for varying lengths of time. It was found that a capacity load of corms in a burlap sack soaked for seven hours and upwards drained 50 per cent. or more of the mercuric chloride from a 1 in 1,000 solution. In 17-hour comparative tests at 60° and 73° to 75° F., the quantity of the chemical removed from the solution was considerably larger at the higher temperature (0·66 as compared with 0·55 gm. per l.). Corm size did not affect the extent of adsorption of the chemical. In an immersion period of 24 hours some 31 per cent. of the initial 1 gm. per l. of mercuric chloride is taken up by the sack, and the remaining 20 per cent. or more adsorbed by the corms, the thin tunic scales withdrawing four to ten times as much from the solution as the corms proper. The addition of half the initial amount of mercuric chloride to solutions previously used for a 17-hour soaking failed to restore them to the requisite concentration, and it was not found possible to devise a rule-of-thumb method for the maintenance of the solution at the correct strength for re-use. Growers should therefore either prepare a fresh solution for each load of corms, or re-charge the original one on the basis of the results of the potassium iodide test recommended for a similar purpose in connexion with potato disinfection in *Leafl. N.Y. St. Coll. Agric.* (unnumbered), 1931 [cf. *R.A.M.*, xi, p. 671], the test being made, however, after each treatment instead of after two, as in the case of potatoes.

Tompkins (C. M.) & Middleton (J. T.). **A mosaic disease of Primula obconica and its control.**—*J. agric. Res.*, lxiii, 11, pp. 671–679, 3 figs., 1941.

A mosaic disease of *Primula obconica*, first observed in greenhouses at San Francisco in 1937, is stated to have caused serious losses affecting from 5 to 25 per cent. of seedlings. The disease is characterized by a prominent leaf mottle, consisting of irregular, dark green islands on a light green to yellow background, upward curling and cupping of the leaves with occasionally a shoestring effect at or near the tip, severe stunting of the whole plant and dwarfing of leaves, petioles, and peduncles, a conspicuous colour-breaking or variegation of the petals and calyx-mottling in the infected flowers. The virus proved readily transmissible by juice inoculation with carborundum, the incubation period ranging from 16 to 21 days. All attempts to transmit the virus by means of the aphids *Myzus persicae* and *M. circumflexus* in the greenhouse were unsuccessful. The virus retained its infectivity after ageing for only 24 hours at 22° C., was inactivated by ten minutes'

heating at 50°, and had a dilution tolerance of 1 to 10. The host range of the virus appears to be limited to the original host, *P. malacoides*, and *P. sinensis*, no infection resulting from mechanical inoculation of 46 other plants representing 42 genera in 23 families. The disease was eradicated from greenhouses at San Francisco by careful roguing of diseased plants and weekly fumigation of the houses with nicotine dust.

KEVORKIAN (A.). **Enfermedades de las Orquideas.** [Orchid diseases.]—*Rev. Agric. P. Rico*, xxxii, 3, pp. 345–346, 1940.

In this paper (translated into Spanish by R. R. Cuitrón), the author gives popular notes on the following orchid diseases and their control: anthracnose (*Gloeosporium* and *Colletotrichum* spp., any one of 36 of which may be responsible), leaf spots caused by *Phoma*, *Macrophoma*, *Diplodina*, *Hendersonia*, and *Cercospora* spp.; rusts (*Uredo* and *Puccinia* spp.) on species of *Cattleya*, *Cypripedium*, *Epidendrum*, and others; rhizome infections (*Phytophthora* and *Fusarium*), the former particularly affecting species of *Cattleya* and *Vanda*; and root rot (*Sclerotium rolfsii*).

TOMPKINS (C. M.) & ARK (P. A.). **Verticillium wilt of Strawflower.**—*Phytopathology*, xxxi, 12, pp. 1130–1134, 3 figs., 1941.

In 1938 a severe wilt of strawflower (*Helichrysum bracteatum*) caused the loss of about one-third of the marketable crop in San Mateo County, California, where in the two succeeding years the damage from the same source amounted to half and two-thirds, respectively. Comparable losses were sustained elsewhere in the same county and smaller ones in Santa Barbara County. The disease is characterized by wilting of the foliage, proceeding from the base upwards and followed by chlorosis, the development of brown, necrotic, coalescent areas, and ultimate desiccation, the leaves remaining attached to the stem but hanging in a vertical position. An apical whorl of turgid leaves, unaffected by the wilt, may sometimes be observed. The vascular tissues of the roots and stem show a blackish-brown discoloration, extending for a considerable distance above soil-level, while early infection reduces the length of the stem internodes, with consequent stunting of the plants. The infected plants are scattered throughout the fields, which present a scorched aspect from a distance. In cases of severe infection (the average in most fields is 90 to 100 per cent.), less than 5 per cent. No. 1 grade flowers are available for processing and marketing, and the loss to growers is therefore considerable.

Verticillium albo-atrum [*R.A.M.*, xx, p. 118] was isolated from the diseased tissues on Czapek's and potato dextrose agar and inoculated with positive results into its own host, Acala cotton, eggplant, and sunflower. Monospore cultures of some of the isolates segregated into two groups, conidial and mycelial (Hansen's 'dual phenomenon' [ibid., xvii, p. 830]), both of which were equally pathogenic. Evidence of the transmission of the fungus by way of the seed was not forthcoming, so that control may be effected by the use of clean soil. In 1940 a small field of strawflowers at Montara not hitherto planted with the crop remained free from the disease.

Presley (J. T.). **Saltants from a monosporic culture of Verticillium albo-atrum.**—*Phytopathology*, xxxi, 12, pp. 1135–1139, 2 figs., 1941.

On a synthetic mineral-agar medium enriched with asparagin (1·5 gm.) and dextrose (20 gm.), monospore cultures of *Verticillium albo-atrum*, originally isolated from a chrysanthemum plant at St. Paul, Minnesota, developed such a striking diversity of saltants, ranging from black to pure white, from very fluffy to completely submerged, and with or without microsclerotia of varying sizes, as to call in question the validity of some of the so-called morphological characters used to separate this species from *V. dahliae*. All Van Beyma thoe Kingma's forms [*R.A.M.*, xix, p. 367] appear to be represented in the writer's series of cultures, so that both the dark mycelial colonies commonly associated with *V. albo-atrum* and the abundant microsclerotia typical of *V. dahliae* [ibid., x, p. 757 *et passim*] are obtainable from a monospore culture of the former. It is suggested that the cultural changes reported by various workers may well have occurred as a result of sectoring and unconscious selection towards a type, of which the raised, white growth would be more easily manipulated than the black mycelium, in successive transfers of the fungus.

Gäumann (E.). **Zur Kenntnis einiger Gräser-bewohnenden Uromyces-Arten.** [A contribution to the knowledge of some herbicolous species of *Uromyces*.]—*Phytopath. Z.*, xiii, 5, pp. 505–516, 1941.

The results of cross-inoculation experiments at the Federal Technical Institute, Zürich, with *Uromyces dactylidis* from *Dactylis glomerata* on 17 species of *Ranunculus* disclosed the existence, in addition to the five physiologic races of the rust already known, of a sixth on *R. repens*, to which the name of f. sp. *repenti-dactylidis* is applied. The new race also infects *D. aschersoniana*. The strain of *U. dactylidis* from *R. valdepubens* (a subspecies of *R. bulbosus*) infected only these two out of six species tested, thereby confirming the validity of Plowright's (*Quart. J. micr. Sci.*, N.S., xxv, pp. 151–172, 1885) f. sp. *bulbosi-dactylidis*, to which *D. aschersoniana* is likewise susceptible.

On a similar basis of cross-experimentation three physiologic races of *U. festucae* are distinguished, viz., f. sp. *rubrae* which is only able to infect *Festuca rubra*, f. sp. *ovinae* Bubák on *F. duriuscula*, but also capable of infecting *F. capillata* and *F. ovina*, and f. sp. *rupicaprina* on *F. rupricaprina*, infecting that host and *F. halleri*, while the seven physiologic races already known of *U. poae* [*R.A.M.*, xix, p. 303] are supplemented by an eighth, f. sp. *repenti-pratensis*, with its aecidial and teleutospore stages on *R. repens* and *Poa pratensis*, respectively, *P. angustifolia* also being susceptible.

Sprague (R.). **Some leaf spot fungi on western Gramineae.**—*Mycologia*, xxxiii, 6, pp. 655–665, 1 fig., 1941.

Notes are given on nine incompletely known or hitherto undescribed species of fungi causing leaf spots of grasses in western parts of the United States, including *Phyllosticta owensii* n. sp. (associated with *Scolecotrichum graminis*) on living, dead, or salt spray-injured leaves of *Dactylis glomerata*; *P. anthoxella* (associated with *Colletotrichum graminicola* and *Titae* sp.) on dead basal leaves of *Anthoxanthum odoratum*;

P. roglerii n. sp. (associated with *C. graminicola*) in living leaves of *Digitaria sanguinalis*; and *P. sorghina* (syn. *P. sacchari*, *P. setariae*, *P. glumarum-sorghi*, *P. glumarum-setariae*, *P. phari*, *P. penicillariae*, and *Phoma insidiosa*) on *Setaria viridis* and *Tricholaena rosea*. *Phyllosticta sorghi* Anzi (on *Sorghum saccharatum* and *S. vulgare*) is an older name than *P. sorghina*, but was not validly established, as no pycnidia or spores were described.

Sprague (R.). **A blotch and char-spot of western grasses.**—*Northw. Sci., Wash.*, xv, 4, pp. 81–85, 1 fig., 1941.

Septogloeum oxysporum Bomm., Rouss., & Sacc. produces on various grasses in western North America tawny, yellow-edged, circular, later elliptical to elongated lesions, which become covered with dull black, charcoal-like streaks, 2 to 5 mm. wide and often several times as large. The centre of the lesion is frequently of a pale grey or isabelline shade; pycnidia may sometimes be detected as small, black dots along the margin, but they are more often observed by the charcoal-like stromata. Isolations of the fungus from *Arrenatherum elatius* [*A. avenaceum*] at the Oregon Agricultural Experiment Station on potato dextrose agar at 40° F. made rather slow growth, the colonies being pale buff with tawny shades. The non- to tri-, mostly bi-septate, yellow to subhyaline, fusoid conidia are often slightly flattened on one side, subtruncate at the base, tapering towards an obtusely pointed apex, and arise from hyaline, globular or subcuspidate conidiophores, their dimensions in the 20-odd collections examined by the writer ranging from 17 to 23 by 2·7 to 3·9 μ to 29 to 33 by 4·4 to 47 μ. The pycnidia found on four of the specimens were subglobose, brown, 80 to 160 μ in diameter, and provided with ostioles up to 60 μ in diameter; the pycnospores resembled the conidia arising from the creosote-brown stromatic tissue except in their virtual absence of colour. Perithecia of the fungus are globose to very strongly flattened, up to 250 μ in diameter; nearly mature asci, short, fasciculate, and aparaphysate, were observed in material from *Elymus condensatus*. Other hosts of *S. oxysporum* include *Agropyron spicatum*, *Agrostis hallii*, *Calamagrostis inexpansa*, *Bromus ciliatus*, *Distichlis stricta*, and *E. glaucus*, the States yielding specimens, besides Oregon, being North Dakota, Colorado, California, Wyoming, Washington, and Utah.

The confused taxonomy of the fungus is fully discussed and its synonyms listed as *Mastigosporium album* var. *athrix* Eriks., *Fusoma biseptatum* Sacc., *F. triseptatum* Sacc., *F. psiliense* Bres. & Vesterg., and *S. athrix* (Eriks.) Sprague [*R.A.M.*, xviii, p. 34]. It is expected that the organism will eventually be assigned to a *Dothidella*-like genus, being akin to, if not identical with, *D. aristidae* (syn. *Phyllachora aristidae*, *Dothidea aristidae*).

Hansing (E. D.) & Lefebvre (C. L.). **Smut sori from ovarial and staminal tissues of certain grasses.**—*Phytopathology*, xxxi, 11, pp. 1043–1046, 2 figs., 1941.

Wide variations were observed in 1935–6 in the size and shape of the sori of certain smuts produced on different organs of native Kansas

grasses of the Andropogoneae, such discrepancies being particularly marked in the case of *Sorosporium everhartii* on *Andropogon furcatus* [*R.A.M.*, xviii, p. 11], on which the staminal tissues bear much smaller and more slender sori than those formed in the ovaries. Of all the sori produced in the latter region, 39 per cent. in a collection of 148 spikelets and 32 per cent. in one of 219 developed in the pedicellate staminate spikelets, i.e., from rudimentary ovaries which are normally sterile; these sori were almost as large as those arising from the corresponding tissues of the sessile, normally fertile spikelets. In individual spikelets, sessile or pedicellate sori may develop from ovarial tissue or staminal primordia only, or from ovarial tissue and one, two, or three staminal primordia, staminal sori apparently showing a greater tendency to develop in the pedicellate than in the sessile spikelets.

Sorghum infected by *Sphacelotheca sorghi* and *S. cruenta* also bore sori from both the staminal and ovarial tissues, the tips in some cases being compound, i.e., made up of four parts, three staminal and one ovarial, which are united below to form the usual simple base. Even the sori with simple tips appear to have originated from both types of tissue and the parts united at a very early stage of development. The first-named author (unpublished thesis of the Kansas State College of Agriculture) found that 50 per cent. of the pistillate sori of *S. occidentalis* on *A. furcatus*, and of *S. cruenta* on *Sorghum halepense* were in the pedicellate spikelets. The male inflorescence of maize is often found to be attacked by *Ustilago zeae* and *Sorosporium reilianum*.

Neill (J. C.). **Britain wants ergot from N.Z. !**—*N.Z. J. Agric.*, lxiii, 5, pp. 397–398, 3 figs., 1941.

Directions are given for the collection by schoolchildren of ergots [*Claviceps purpurea*: *R.A.M.*, xxi, pp. 2, 135], which occur on many different grasses in New Zealand, the most valuable kind being found on tall fescue [*Festuca* sp.].

Bell (J. E.). **How to harvest and clean ergot.**—*N.Z. J. Agric.*, lxiii, 5, pp. 399–400, 4 figs., 1941.

Ergot [*Claviceps purpurea*: see preceding abstract] is ready for collection from tall fescue [*Festuca* sp.] in New Zealand from December onwards. It can be harvested by cutting off the heads or by hand-stripping them. Cut heads should be well dried by being stood on end in the sun or spread out on the ground, or on sheets of iron, bags, or canvas. The ergot is then threshed by tapping the heads against a piece of wood. Hand-stripped ergot should be laid out to dry on sheets of any suitable material. The mixed ergot and grass seed is then winnowed, care being taken not to damage or break the ergot. In the absence of a machine, winnowing can be effected by throwing the material several times in a draught of wind, when the ergot will fall close to the thrower, and the lighter seed, straw, and dust farther away. Alternatively, the mixed ergot and rubbish can be thrown into a pail of water and the undesired material floated off. The ergot should at once be dried in the sun and placed in air-tight tins, ready for sale to the produce merchant.

Nath (P.) & Padwick (G. W.). **Ergot in India.**—*Curr. Sci.*, x, 11, pp. 488–489, 1941.

Ajrekar has suggested that *Sphacelia sorghi*, the agent of a sorghum disease in India, is the imperfect stage of a species of *Claviceps* [*R.A.M.*, vi, p. 91]. In the autumn of 1941 the senior author observed a severe attack of ergot near Simla, at an altitude of 6,500 ft., on three grasses, viz., *Brachypodium sylvaticum*, *Oplismenus cosmopolitus*, and *Andropogon*? *gryllus*, the dimensions of the sclerotia on which were up to 35 by 1·5 to 2 mm., 9 by 1 to 1·5 mm., and 14 by 1 to 1·5 mm., respectively, and their colours 'dusky brown' (Ridgway) externally and pale pinkish-cinnamon internally, 'chaetura black' externally and white internally, and 'sooty black' externally and white internally, respectively, while the conidia measured 2·1 to 7·8 by 1·8 to 3·9 (mean 5·5 by 2·9) μ, 3·9 to 6·1 by 1·8 to 2·8 (5·2 by 2·0) μ, and 3·6 to 11 by 1·8 to 4·6 (5·6 by 3·0) μ, respectively. The fungus concerned is thought to be a species of *Claviceps*, probably *C. purpurea* or *C. pusilla* [ibid., xxi, p. 82], the relatively large conidial dimensions being in favour of the latter species.

Gillespy (T. G.). **Studies on the mould Byssochlamys fulva (III).**—*Rep. Fruit Veg. Pres. Sta., Campden, 1940*, pp. 54–61, 3 graphs, 1941.

Experimental data are reported showing that, in suspending media of bottled fruit liquid or citrate buffer solutions below P_H 3·7, the asci of *Byssochlamys fulva* [*R.A.M.*, xix, p. 227] were much more susceptible to heat in the presence of small concentrations of sulphur dioxide. Thus, a temperature of 170° F. was much more lethal to the mould in a medium containing 10 p.p.m. sulphur dioxide than one of 185° without the compound, and similarly 180° was nearly as effective as 190°. With 2 p.p.m. sulphur dioxide, a temperature of 185° was almost as destructive as one of 190° without it. Expressed in terms of time, at 170°, 175°, and 180°, 10 p.p.m. sulphur dioxide reduced the period requisite for the extermination of 200 asci per ml. from infinity to 29, 20, and 14 minutes, respectively, and at 185° and 190° from 45 to 10 and from 13 to 5½ minutes, respectively; at 185° and 190°, 2 p.p.m. curtails the corresponding period from 45 to 14 and from 13 to 6 minutes, respectively. Tentative experiments showed sodium thiosulphate to be about one-third, and sodium hyposulphite twice, as effective against *B. fulva* as sodium sulphite.

Weber (G. F.). **Thread blight of woody plants.**—*Pr. Bull. Fla agric. Exp. Sta.* 551, 2 pp., 1940.

Among the many hosts of thread blight (*Corticium stevensii*) recognized in Florida since 1900 are pear, pecan, fig [*R.A.M.*, xix, p. 294], persimmon, citrus, guava, and tung oil trees [*Aleurites*]. The fungus causes partial or total defoliation and attacks the fruits, and by means of its sclerotia, which are resistant to unfavourable environmental conditions, it is perpetuated for several years on the host twigs. These organs are formed during the dormant period round the terminal and lateral buds and along the internodes, where they are suitably located to give rise to spores and thereby initiate new infections when new

growth is resumed. Satisfactory control of thread blight has been secured by a combination of pruning and spraying with 4–4–50 Bordeaux mixture.

Southwick (F. W.) & Childers (N. F.). **Influence of Bordeaux mixture and its component parts on transpiration and apparent photosynthesis of Apple leaves.**—*Plant Physiol.*, xvi, 4, pp. 721–754, 4 graphs, 1941.

Experiments [which are fully described] made to determine the rates of transpiration and apparent photosynthesis of apple leaves sprayed with Bordeaux mixture under different conditions of temperature, light, humidity, and soil moisture demonstrated that applications of the spray exercised, at least temporarily, a retarding influence on photosynthesis, regardless of temperature, humidity, light intensity, or soil moisture conditions. In the absence of visible injury (which developed at 50° and 60° F.), however, the rate of photosynthesis returned to normal whenever the spray residue was removed from the leaves.

The evidence also showed that some days after the applications of Bordeaux mixture had been made, the rate of carbon dioxide absorption returned to normal, even when the spray residue was not removed from the leaves. It would, therefore, seem that the primary retarding influence of Bordeaux mixture on apple leaves was due, not to mechanical shading, but to some physiological effect produced by the mixture.

As hydrated lime did not appear to exercise a detrimental effect on the rate of photosynthesis, while copper sulphate retarded it, it was assumed that the copper fraction in the Bordeaux mixture was the chief cause of the reduced photosynthesis. The diffusion of copper into the leaf tissue could occur only if copper were present in a soluble form. It might, therefore, seem that no soluble copper would be present in Bordeaux mixture (4–6–100), which contains more than sufficient lime to precipitate all the copper sulphate present. To clear up this point, experiments were made with Bordeaux mixture (4–6–100), hydrated lime (0–6–100), and copper sulphate (4–0–100) and it was found that starch was retained in the leaves treated with copper sulphate long after it had escaped from the controls. A few of the Bordeaux-treated leaves appeared to contain starch after none was present in the controls, but in no case were the results as marked as in the leaves treated with copper sulphate. The leaves sprayed with hydrated lime did not appear to retain starch longer than the controls.

The temperature at which Bordeaux mixture may be expected to cause visible injury to apple foliage would appear to lie between 60° and 70°.

Bordeaux mixture and its component parts appeared to have either no effect, or a retarding one, on transpiration rate. The general effect of the mixture on young apple trees growing under low soil moisture conditions was slightly to reduce the transpiration rate.

Keitt (G. W.) & Langford (M. H.). **A preliminary report on genetic studies on pathogenicity and the nature of saltation in Venturia inaequalis.**—*Phytopathology*, xxxi, 12, p. 1142, 1941.

At the University of Wisconsin two classes of monosporous isolates

of *Venturia inaequalis* [*R.A.M.*, xix, p. 548] were studied for their pathogenicity to certain differential apple varieties in the greenhouse: (1) 'lesion', inciting typical sporulating lesions, and (2) 'fleck', giving rise to yellowish flecks with few or no spores. Crosses were made *in vitro* and the eight ascospores from an ascus of each progeny were cultured and the pathogenicity of their lines investigated. Lesion × lesion produced eight lines lesion, fleck × fleck eight lines fleck, and lesion × fleck, four lines of each type. Certain sector lines were shown to differ genetically from their parents. The original monoascosporous lines D5 × D8 (both pathogenic) produced eight-spored asci, giving rise to eight pathogenic lines, while the eight-spored asci from D5 × D8 sector (non-pathogenic) segregated into four pathogenic and four non-pathogenic lines and D5 × sector from D8 sector (non-pathogenic) fell into two pathogenic and six non-pathogenic lines. Certain crosses of non-pathogenic sector lines with pathogenic lines yielded four-spored asci, of which the four lines showed the same pathogenic reactions as the pathogenic parent. In the absence of any possibility of heterocaryosis the sectors are presumed to have arisen through mutation.

Keitt (G. W.) & Langford (M. H.). **Venturia inaequalis (Cke.) Wint. I. A groundwork for genetic studies.**—*Amer. J. Bot.*, xxviii, 9, pp. 805–820, 12 figs., 1 graph, 1941.

In studies designed to serve as a groundwork for further genetic investigations of *Venturia inaequalis* [see preceding abstract] in relation to basic pathological problems, experiments were conducted to determine the cultural behaviour, sexual compatibility, and pathogenicity of four sets of monoascosporic isolates, each set comprising eight isolates from a single ascus with record of the serial order of the spores.

The isolates were cultured under standardized conditions by successive monosporic transfers on malt agar plates. According to colony characters, the eight isolates of each set comprised four groups, each consisting of a pair of like isolates. Each of the 16 pairs was distinguishable from every other pair by colony characters, but the two members of any pair could not be differentiated by any test applied. During three years the differential cultural characters of all the lines remained highly constant.

The fungus was bred *in vitro* in plates of malt agar containing dead apple leaf decoction. Perithecial initials appeared when the cultures were about four weeks old. Grown separately, each isolate produced both antheridia and ascogonia, but the perithecial initials generally remained small and in no instance produced asci. Mixing of the conidial suspensions of the two isolates to be paired in the Petri dish before pouring in the agar proved far more effective than streaking or planting the inoculum on the medium. Ascogonia may be produced by both isolates of a pairing but usually more freely by one than the other. Several antheridia were usually appressed to the trichogyne of each ascogonium. The perithecia of most pairings reached a maturity peak after four to five months. All the isolates studied were hermaphroditic and self-incompatible. The eight isolates from each ascus fell into two groups of four, one group intra-group incompatible and the other intra-

group compatible and the 32 isolates from four sets comprised the two above-mentioned groups of 16 isolates each.

When the pathogenicity of the 32 isolates was tested under partly controlled greenhouse conditions on leaves of nine apple varieties, in each set all eight isolates caused typical sporulating lesions on one or more varieties, while on others some isolates caused sporulating lesions and other isolates did not. On differential varieties four isolates of a set generally produced typical lesions, and the other four caused flecks. On the whole, the pathogenicity of the 32 lines neither increased nor diminished during three years' study.

Sector lines showed cultural characters and pathogenic reactions different from those of the original lines. These characters remained comparatively constant, and no sector line reverted to the type of line from which it came.

The data obtained in this and earlier studies [loc. cit.] demonstrate that the third nuclear division in the ascus of *V. inaequalis* is equational and that segregation of factors for pathogenicity and sexual compatibility, respectively, may take place in the first or second nuclear division. The work of Keitt and Palmiter (*Amer. J. Bot.*, xxv, pp. 338–345, 1938) and Keitt, Palmiter, and Langford (abs. in *Phytopathology*, xxviii, 12, 1938) appears to be the first case of segregation for pathogenicity to be experimentally demonstrated for an Ascomycete.

Smock (R. M.) & Watson (R. D.). **Ozone in Apple storage.**—*Refrig. Engng*, xlii, 2, pp. 97–101, 3 figs., 1941.

In experiments at Cornell University, Ithaca, New York, the introduction of 1 to 2 parts per million of ozone into the storage room for one to two hours daily controlled the growth of various rot fungi on McIntosh apples, e.g., *Sclerotinia fructicola*, *Penicillium expansum* and other *P.* spp., *Botrytis cinerea*, and *Cephalothecium* [*Trichothecium*] *roseum*. Used continuously at the rate of 15 p.p.m. at a temperature of 40° F., it reduced the number of spores per cu. yd. of atmosphere from 4,280,000 to 2,760. Exposure of wet spores of *S. fructicola* and *P. expansum* to 0·6 p.p.m. of ozone for 2½ hours at room temperature with a relative humidity of 85 to 90 per cent. completely plasmolysed them. None of the varieties tested suffered any injury from the ozone treatment at 32° for the prescribed period of an hour or two daily at concentrations of 2 to 3 p.p.m., but the sensitive Golden Delicious is liable to develop a blackening of the skin round the lenticels on exposure to unduly high doses. The effects of ozone on scald in Rhode Island Greenings are not clear-cut, but there is some indication of a reduction in the intensity of the defect from the treatment [*R.A.M.*, xx, p. 68].

Fitzpatrick (R. E.) & Woodbridge (C. G.). **Boron deficiency in Apricots.**—*Sci. Agric.*, xxii, 4, pp. 271–273, 1 pl., 1941.

In the spring of 1935, 13 one-year-old apricot trees were planted in iron tubs filled with sand from the shore of Lake Okanagan, at Summerland, British Columbia. Throughout the remainder of the year and 1936 the sand was watered with a nutrient solution made chiefly from commercial fertilizer materials, no boron being added. In the spring of 1937 the trees were divided into two groups, six trees being given a

complete nutrient ration made from C.P. salts, supplemented with boric acid, while the remainder received the same ration, without boron.

The trees continued to thrive in 1937, 1938, and 1939, but in 1939 the boron content of the fruit from the trees not receiving this element showed a marked drop. In the following spring (1940) all these non-boron-treated trees developed deficiency symptoms [cf. *R.A.M.*, xix, p. 30]. In the worst cases the terminal twigs died back. Where this was noted the twigs appeared healthy in early spring, but the buds either failed to develop or died at the green tip stage. The cambium and bark succumbed shortly after, and the twigs shrivelled progressively from the tips. Two trees died in this manner without developing any foliage, two, though severely affected, developed some leaves, while the remainder showed symptoms only in the first leaves. Some leaves, from buds that had only sufficient vitality to develop past the green-tip stage, were much dwarfed, spatulate, and curled up at the margins; most began to blacken at the tip shortly after unfolding, and finally they shrivelled and dropped off. In general, the leaves were brittle, narrow, and pale between the veins. Occasionally, the midrib and main lateral veins were thickened, and the leaves often assumed a boat-like form. Characteristically, the effects occurred together in the same tree, certain branches dying back, while others remained more or less normal. No fruit developed on the trees untreated with boron.

Similar die-back and foliage symptoms were seen in several apricot orchards in the Okanagan Valley in the spring of 1940. Chemical analysis of the twigs of one affected tree showed that the boron content was 4·5 p.p.m., that of two healthy trees being 20·8 and 20 p.p.m., respectively. In one affected block the trees were sprayed in May with boric acid solution (4 lb. per 100 gals. water), with the result that recovery ensued.

Traub (H. P.), Pomeroy (C. S.), Robinson (T. R.), & Aldrich (W. W.). **Avocado production in the United States.**—*Circ. U.S. Dep. Agric.* 620, 28 pp., 7 figs., 1941.

Included in this circular are brief notes on the principal diseases of the avocado and their control in the United States, reference to which has already been made [*R.A.M.*, xiv, p. 707; xx, p. 483, *et passim*].

Kreutzberg (V. E.). **A new virus disease of Pistacia vera L.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xxvii, 6, pp. 614–617, 3 figs., 1940.

A new virus disease of the rosette type was observed on a wild pistachio tree (*Pistacia vera*) in Turkoman in 1935, and was later found occurring in the same forest belt stretching into Uzbekistan and Tadjikistan. It is believed to occur also in the adjoining regions of northern Afghanistan and northern Iran. In pistachio plantations in the Kushkinskaya forest an average of 62 per cent. of trees was infected, the disease affecting 13·2 per cent. of the branches in the crown. The yield of affected individual trees was reduced by 45·2 per cent., the average decrease in the yield of the whole plantation being 34·72 per cent. The infected trees are depressed in growth and form rosettes of varying size (up to 1 m. across) consisting of densely interlaced, short, thin twigs with swollen nodes and slender internodes. The leaves are smaller

than in healthy plants, the lamina shows a wavy pattern, and the veins are abnormally prominent especially on the upper surface with profusely developed vein nodes; the petiole and the midrib are flattened, stipules forming at the base of the petiole. On the under side of the leaf, the petiole and ribs as well as the adjoining portions of the blade are slightly lighter in colour with occasional clearing. The shoots arising from stems and stumps are profusely branched and have long, thin internodes and only a few, narrow leaves. The flower buds are abnormally inflated, several buds being frequently set in the axil instead of the normal one. The pistillate floral panicles are elongated and curved, and the flowers deformed, and often partly or completely proliferated. Most of the staminate flower buds proliferate completely or partially, do not form pollen, and die before the spring, the remaining forming short, dwarfed, dark green or red panicles. The fruits are deformed, much enlarged, and parthenocarpic, growing in very compact clusters and producing no seeds. In the extreme stage of infection dark green proliferated panicles appear every year instead of fruits.

The virus was successfully transmitted through the seed and by means of the insect *Liothrips pistaciae*, but not through pollen or juice. Of 200 fruits taken from affected plants, 87 failed to germinate, 92 produced diseased seedlings, and 21 were healthy. Transmission by grafting, particularly by 'oculation' [? budding], was sometimes successful. The ability of the insect to transmit the virus appeared to be confined to one generation. The first symptoms of the disease appeared 21 to 25 days after infection. For control purposes it is recommended that affected branches be removed when the crowns are cleared and trimmed, and that cuttings for grafting and seeds for sowing should be taken only from sound trees.

Peterson (P. D.). **The spore-germination method of evaluating fungicides.**—*Phytopathology*, xxxi, 12, pp. 1108–1116, 1 fig., 1941.

A full description is given of a method for the evaluation of fungicidal efficiency based on that of Montgomery and Moore (*Rep. E. Malling Res. Sta., 1934*, pp. 217–222, 1935), who pipetted measured amounts of test materials on to 15 mm. circles cut into glass slides. In the writer's procedure five 12 mm. glass circles, after washing, sterilization, boiling in distilled water, and drying, are glued, 1 mm. apart, to 75 by 25 mm. slides with petrolatum for the reception of measured quantities of nutrients, toxic solutions, and spore suspensions pipetted either separately or in combination. Special directions are given for the transference of hanging drops of sulphur fungicides to the circles with a glass rod, 6 by $\frac{3}{16}$ in. With the aid of this method a single slide of the requisite dimensions can be made to carry up to ten different treatments, the fungicidal dosage being accurately controlled and variation in depth and configuration of the drops practically eliminated.

Conidia of *Sclerotinia fructicola* failed to germinate satisfactorily in distilled water when removed from the sporulating surface by means of a needle or brush in such a way as to avoid contamination with nutrients from the culture media. Of the various nutrients tested potato dextrose agar extract proved to exert the maximum stimulus on germination, a high percentage being induced by the extraction of 0·1 gm.

Difco potato dextrose agar powder with 100 ml. water. The writer found that about 20 spores per high-power field of 380 μ diameter is a desirable maximum for *Sclerotinia* conidia. At this concentration satisfactory germination in the above-mentioned potato dextrose agar extract was obtained in 1 hour.

Cupples (H. L.). **Relation between wetting power of a spray and its initial retention by a fruit surface.**—*J. agric. Res.*, lxiii, 11, pp. 681–686, 2 graphs, 1941.

In studying the relation between the wetting power of a spray mixture and its retention on the sprayed surface of fruits, a rotating apple was sprayed with solutions of sodium bicarbonate of known spreading coefficient until it began to run off the surface, and then the volume of the spray solution retained on the apple was determined. Variation in the wetting power of the spray solutions was induced by the addition of varying amounts of a wetting agent and the spreading coefficient determined on mineral oil by the method described by the author in *Industr. Engng Chem.*, xxix, pp. 924–926, 1937. When plotted against each other, the value of the spreading coefficient and that of the relative retention of spray appeared closely related. It is suggested that the spreading coefficient on a reference mineral oil may be used as a practical measure of the wetting properties of aqueous spray solutions.

Bell (H. P.). **The origin and histology of Bordeaux spray russeting on the Apple.**—*Canad. J. Res.*, Sect. C, xix, 12, pp. 493–499, 10 figs., 1941.

When Red McIntosh apple trees growing at Kentville, Nova Scotia, were sprayed with Bordeaux mixture at full bloom in 1939 and 1940, examination of the russeted tissue of the fruit showed the first apparent injury to consist in a browning of the epidermal cells at the base of the hairs. Growth of these discoloured cells became inhibited, and, as a result, cracks developed as the fruit enlarged. Adjacent hypodermal and cortical tissue was exposed and killed. Cork cambiums and cork were formed in the cortex. Further enlargement of the fruit caused the cracks to multiply, extend tangentially, and deepen. All tissues external to the innermost point of fissure penetration were killed. The final scurf-like patches of scar tissue were found to consist of dead epidermis, hypodermis, cortex, cork, and cork cambiums. This scar tissue resulting from induced russeting originated in the hypodermis and was not true cork, which, strictly, is a homogeneous tissue originating in the epidermis. All the sections examined showed that when the injury first appears the cuticle is still intact and without any sign of corrosion. Hence no morphological evidence was forthcoming in support of the view that the spray induced saponification of the cuticle [*R.A.M.*, xviii, p. 466].

Ministry of Agriculture and Fisheries—Advisory Leaflets Nos. 53, 62, 205, 245, and 248.—London, H.M. Stationery Office. 1*d* each.

Of these leaflets, all published during 1941, No. 53 deals with tomato wilt or 'sleepy' disease, *Fusarium* [*bulbigenum* var. *lycopersici*] and

Verticillium [*albo-atrum*], of which the latter is much the more important in England [*R.A.M.*, xx, pp. 324, 437, 446]; No. 62 with white rot of onion bulbs (*Sclerotium cepivorum*) [ibid., xx, p. 442]; No. 205 with apple mildew (*Podosphaera leucotricha*), particularly troublesome on Lane's Prince Albert and Cox's Orange Pippin in Cambridgeshire and Worcestershire; No. 245 with apple and pear scab (*Venturia inaequalis* and *V. pirina*); and No. 248 with brown rot and allied disease of plum (*Sclerotinia fructigena* and *S. laxa*). All the leaflets are amended, with the exception of No. 245, which is entirely re-written and re-illustrated.

Stevens (N. E.) & Stevens (R. B.). **Recent developments in plant diseases in the United States.**—*Bot. Rev.*, vii, 12, pp. 714–736, 5 graphs, 6 maps, 1941.

In continuation of a previous paper by the senior author and Jessie I. Wood [*R.A.M.*, xvi, p. 765], a summary of the available information, largely gleaned from the *Plant Disease Reporter*, is presented concerning a number of plant diseases of special topical interest either by reason of their recent appearance in the United States or of striking fluctuations in extent or severity. Reference has been made in this *Review* from time to time to most of the investigations included in the survey.

Hopkins (J. C. F.). **A descriptive list of plant diseases in Southern Rhodesia (and their control).**—*Mem. Dep. Agric., S. Rhod.*, 2, 51 pp., 1939.

This list is a revision of the author's earlier list of Rhodesian fungi [*R.A.M.*, xvii, p. 627] incorporating short annotations on the symptoms, occurrence, control, and local distribution of the diseases concerned. The publication is designed to be of use to farmers and gardeners as well as to pathologists.

Park (M.) & Fernando (M.). **Diseases of village crops in Ceylon. Peradeniya Manuals No. IV.**—vi+72 pp., 32 pl. (8 col.), Colombo, Ceylon Govt Press, 1941. Rs. 4.

This manual, compiled at the request of the Minister for Agriculture and Lands, Ceylon, aims at the provision for students of a grounding in the fundamental principles of phytopathology, as well as being a reference book for consultation in the diagnosis and control of the more widespread diseases of crop plants, excluding tea and rubber, already comprehensively treated by T. Petch. With these ends in view the writers have presented the material at their disposal in a semi-popular form, and have drawn extensively on a number of well-known treatises on plant pathology in general and certain tropical crops in particular. Mention should be made of the coloured reproductions executed by the Survey Department.

Mather (K.). **Heterothally as an outbreeding mechanism in fungi.**—*Nature, Lond.*, cxlix, 3767, pp. 54–56, 1942.

In discussing the problem of heterothally the author examines the breeding system of fungi [*R.A.M.*, xx, p. 588] by the same methods as those used to explain the behaviour of Angiosperms, and arrives at the conclusion that all levels of controlled outbreeding can be traced in

fungi. In the latter, however, the mating behaviour is a property of the haploid phase, while in the former the diploid zygote plays a predominant part.

The genetical mechanism of outbreeding in fungi is described, from the simple case of one set of paired allelomorphs, reducing the possibility of sister-matings to one in two, to the elaborate arrangement of multiple allelomorphic series at several loci, a system which not only decreases still further the possibility of self-mating but also increases the ratio of possible non-sister matings. From the examples supplied it can be seen that the complications of heterothally fit into an ordered scheme when viewed as adaptations to the control of outbreeding. Basically, the function and genetic structure of heterothally are stated to be the same as those of systems found elsewhere, the superficial differences being imposed by peculiar circumstances arising from the existence of an independent haploid phase.

Armstrong (E. F.). **The rot proofing of sandbags.** — *Chem. & Indust.*, lx, 37, pp. 668–674, 2 figs., 1941.

This is a detailed account, based on the work of a Committee of the Research and Experiments Department of the Ministry of Home Security, of the most effective methods for the protective treatment of jute sandbags against deterioration caused by microbiological and other agencies [*R.A.M.*, xxi, p. 89].

Sahni (B.). **Permanent labels for microscope slides.** — *Curr. Sci.*, x, 11, pp. 485–486, 1941.

The writer has successfully prevented the peeling-off of labels on microscope slides apt to occur under tropical conditions of extreme humidity by the application with a brush of two or three coats of a thin paint of cellulose solution in amyl acetate, known commercially as 'duco cement'. The solution dries up almost immediately, forming a transparent film extending beyond the edge of the label and firmly affixing it to the slide.

Conn (H. J.) & Conn (Jean E.). **Value of pigmentation in classifying Actinomycetes. A preliminary note.** — *J. Bact.*, xlii, 6, pp. 791–799, 1941.

The well-founded opinion that the colours produced by species of *Actinomyces*, though striking, are too variable to be successfully used for purposes of classification was fully confirmed by studies at the New York State Agricultural Experiment Station on three unnamed strains isolated from the soil (R1, B2, and B3) and a culture of *A. coelicolor* (formerly designed *A. violaceus-ruber*) supplied by Waksman from New Jersey. The organisms were grown on a synthetic medium containing varying amounts of glucose (0·1 to 5 per cent.). In all the strains pigment (as distinct from colour) production was fairly constant, the variability in colour being attributed to the fact that the pigments act as hydrogen-ion indicators [*R.A.M.*, xiii, p. 259], so that the appearance of a given culture may differ greatly according to whether the pigment is present in its alkaline or acid phase, or partly in each form.

It is evident from these and other data accumulated in previous

studies (*J. Bact.*, xxxix, p. 21; xl, p. 168, 1940) that these pigments differ from one another, but at the same time they share a few characteristics, all being more soluble in alkaline than in neutral solutions, their acid phases almost insoluble in water, and their alkaline phases deeper in tone than their acid ones. Presumably the pigments are acid dyes with insoluble colour acids, but highly soluble sodium salts; their exact chemical nature, however, has not been determined.

Snyder (W. C.) & Hansen (H. N.). **The effect of light on taxonomic characters in Fusarium.**—*Mycologia*, xxxiii, 6, pp. 580–591, 2 figs., 1941.

When strains of *Fusarium solani*, *F. solani* f. *cucurbitae*, *F. oxysporum* f. *niveum*, and *F. avenaceum* were grown in culture in daylight, the light being excluded from duplicate series, the colours displayed by the fungi fell into three groups on the basis of their relation to light. The flesh-ochre and cinnamon-pink pigments displayed by *F. oxysporum* f. *niveum* occurred only in the presence of light. The ramier-blue shown by the same fungus developed both in light and darkness. The dusky green-blue of *F. solani* from tomato also developed in light and darkness, but was less obvious in the absence of light, and it was associated with conidial masses, the production of which was much reduced in conditions of darkness. A third type of pigmentation was noted in one strain of *F. solani* f. *cucurbitae* and one of *F. solani*, in which the vetiver-green, dark hyssop-violet, and citron-yellow hues developed much more conspicuously in darkness than in light.

Cultures in the dark consistently showed greater mycelial growth than those kept in the light. All cultures exposed to the light showed zonation in some degree, though this feature was not present in those grown in the dark.

The sporodochial strain of *F. oxysporum* f. *niveum* produced sporodochia copiously in light, but not in darkness. In the pionnotal strain of the same fungus, pionnotes developed much more abundantly in light than in darkness. *F. solani* and its f. *cucurbitae* respectively produced sporodochia moderately and abundantly in light, but only sparsely in darkness. In *F. avenaceum* sporulation was plentiful along the edges of the colony in contact with the glass in light, but not in darkness.

Perithecial primordia of *Hypomyces solani* developed copiously in light, but not at all in darkness after two weeks' growth. After one month both the cultures grown in light and those grown in darkness were fertilized with conidia from the opposite sex strain. Two weeks later perithecia were abundantly present on the cultures in light, and practically absent in the others. The development of the primordia into mature perithecia was favoured by continued exposure to light.

Spores of all strains produced in light were consistently larger, and invariably had more septa, than those that developed in the dark. Evidence was obtained that the effect of light was produced on that portion of the thallus that was in active growth at the time of exposure. Single-spore cultures subjected to light for the first four days of growth only, showed less development than others allowed to remain in light.

The authors conclude that in the case of *Fusarium* species and

similar fungi, such characters as colour, zonation, colony type, presence or absence of sporodochia, size, shape, and septation of macroconidia, and even the occurrence of a perithecial stage, cannot successfully be employed in taxonomy [*R.A.M.*, xix, p. 495] unless the fungi are grown in the presence of adequate light.

Dutcher (J. D.). **The chemical nature of gliotoxin : a microbicidal compound produced by the fungus Gliocladium fimbriatum.**—Abs. in *J. Bact.*, xlii, 6, pp. 815–816, 1941.

Investigations at the Squibb Institute for Medical Research, New Brunswick, New Jersey, on gliocladin, the crystalline isolate from *Gliocladium fimbriatum* possessing marked fungicidal activity [*R.A.M.*, xxi, p. 155], showed it to be also both bacteriostatic and bactericidal towards both Gram-negative and Gram-positive bacteria, completely inhibiting the growth of *Staphylococcus albus*, for instance, at the rate of 2·5 mg. per ml., and that of *S. aureus* and *Streptococcus viridans* at 1 mg., while 10 mg. sufficed to check the development of all the Gram-negative organisms tested. Gliotoxin is toxic to higher animals at doses of 50 to 75 mg. per kg. body weight. The formula for gliotoxin was found to be $C_{13}H_{14}O_4N_2S_2$, and its molecular structure is described.

Hopkins (J. C. F.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 5. Diseases of Potatoes.**—*Rhod. agric. J.*, xxxviii, 12, pp. 672–690, 11 figs., 1941.

Useful notes are given in popular terms on the symptoms and control of potato diseases in Southern Rhodesia, as well as on the conditions predisposing the plants to attack.

Eddins (A. H.). **Brown rot of Solanaceous plants. Soil treatment for control of brown rot of Potatoes.**—*Pr. Bulls Fla agric. Exp. Sta.* 548 (revised), 4 pp.; 553, 2 pp., 1940.

In the first of these two bulletins a popular résumé is given of the available information on brown rot of potatoes and other Solanaceae (*Bacterium solanacearum*), already presented at greater length in a previous publication of the Florida Agricultural Experiment Station [*R.A.M.*, xvi, p. 271]. The pathogen in question is of greater economic importance in the State than all other potato diseases combined. Entire [chilli] pepper plantings may be destroyed by rotation with severely affected potatoes, while in some ten-acre eggplant fields losses of between 50 and 60 per cent. of the plants have been reported.

In the second bulletin full directions are given for the control of *Bact. solanacearum* in sandy soils by the application of commercial flowers of sulphur [ibid., xviii, p. 473] from May to July in quantities sufficient to adjust the existing reaction to P_H 4 or below, in practice representing a range from 300 lb. per acre at P_H 4·4 to 1,300 at P_H 6·4. In the following October and November the soil reaction should be readjusted to P_H 5·2 for potatoes, and 5·5 to 6 for tomatoes, eggplants, and chillies, by the application of calcium limestone at 2,000 to 5,000 lb. per acre. During the period intervening between the two treatments a crop of cowpeas or *Crotalaria* should be grown on the sulphured soil. In the Hastings area, where the soil reactions on most farms range from

P_H 4·8 to 5·2, the cost of the fertilizers should not exceed $20 per acre. In 1935, a season conducive to infection by *Bact. solanacearum*, the yields of marketable eggplants and tomatoes on severely infested land treated the year before exceeded by 10 and 15 times, respectively, those from untreated control plots.

Wheeler (H. E.) & Lutman (B. F.). **Staining scab Actinomyces in aerial Potato parts.**—*Stain Tech.*, xvii, 1, p. 41, 1942.

The method recently described by Hutchins and Lutman for staining the mycelium of *Actinomyces* [*scabies*] in potato roots and tubers [*R.A.M.*, xxi, p. 156] required certain modifications for successful application to the aerial parts of the plants, in which the hyphae are very much finer than in the underground system. For instance, the duration of washing in absolute alcohol had to be reduced, in the case of stem sections, from 30 or 60 minutes to a few seconds in order to obviate complete decolorization, the best results being obtained by simply flooding the slide once or twice and then transferring it to xylol for 24 hours. The coagulation of freshly made crystal violet solutions into a sort of aniline oil emulsion on the slides may be avoided by allowing the solutions to stand for 48 hours, then filtering and repeating the process.

Müller (K. O.) & Orth (H.). **Über einen Spätpflanzversuch mit Kartoffeln.** [On a late planting experiment with Potatoes.]—*Ernähr. Pfl.*, xxxvii, 4–5, pp. 37–40, 1941.

A description is given of a series of preliminary experiments conducted on the premises of the German Potash Syndicate, Berlin-Lichterfelde, in 1940, to determine the adaptability of the BRA 5/31 potato variety for late planting (six to eight weeks beyond the normal date) in succession to winter catch crops. This variety was selected as possessing certain characteristics essential for the purpose in view, including resistance to biotype A of *Phytophthora infestans* [*R.A.M.*, xix, p. 490 and next abstract] and (in comparison with the majority of potatoes at present on the market) also to degeneration. In these tests on a light sandy soil the desirable qualities of BRA 5/31 were fully maintained. Attention has already been drawn by Alten and Orth to the inhibitory action of arginin on sporangial germination in *P. infestans* [ibid., xx, p. 273], and in this connexion an analysis was made of the arginin content of BRA 5/31 leaves and tubers in comparison with those of four other varieties, viz., Ackersegen, Frühmolle, Parnassia, and Böhms Mittelfrühe. The tubers in particular of BRA 5/31 were found much richer in arginin than those of the other four varieties, those from the plot receiving a complete fertilizer (with potash in the form of potassium chloride), for instance, containing 0·36 per cent. on a dry weight basis, compared with 0·081, 0·16, 0·13, and 0·16 per cent., respectively, in Ackersegen, Frühmolle, Parnassia, and Böhms Mittelfrühe.

Hagenguth (K.) & Griesinger (R.). **Untersuchungen über den Stickstoffhaushalt der Kartoffelknolle bei der Phytophthora-Fäule.** [Studies on the nitrogen metabolism of the Potato tuber in *Phytophthora* rot.]—*Phytopath. Z.*, xiii, 5, pp. 517–529, 1941.

The comparative chemical analysis of healthy Jubel potato tuber

tissue and of similar material permeated by *Phytophthora infestans* (biotype A), to which this variety is susceptible, revealed a uniformly higher (average 2 per cent.) water content in the latter, accompanied by a substantial decline (21 per cent.) in non-albuminous nitrogen and a corresponding increase in albuminous, principally protein, nitrogen. These metabolic changes were most pronounced in the upper layers of the tuber halves, i.e., those nearest the site of infection. On the other hand, in the case of the resistant BRA 5/31 variety, on which the pathogen made virtually no growth [see preceding abstract] there was no perceptible decrease of non-albuminous nitrogen (0·7 per cent.). The results indicate that *P. infestans* does not utilize the albumin in the tuber for its growth but assimilates the non-albuminous nitrogen, consisting principally of amino acids. No definite conclusions as regards the relationship between a low non-albuminous nitrogen content and enhanced resistance to late blight and vice versa could be reached on the basis of analyses of the selfed progeny of the resistant variety.

David (Elisabeth) & Störmer (Inge). **Capsicum annuum als Testpflanze für einige Kartoffelviren.** [*Capsicum annuum* as an indicator plant for certain Potato viruses.]—*Phytopath. Z.*, xiii, 5, pp. 532–538, 3 figs., 1941.

Viruses are stated to be among the most harmful pathogens of potatoes at the headquarters of the Pomeranian Seed Selection Association at Dramburg [*R.A.M.*, xviii, p. 133], where the heaviest reductions in yield are caused by streak (Y virus) [ibid., xv, p. 391] and leaf roll. In the Erdgold variety, for instance, the yield from a Y-diseased crop of four years' standing was 19·8 kg. per 100 plants as compared with 104·7 from the same number of healthy ones; a leaf-roll crop of Stärkereiche [Starchy] after four years produced 30·4 kg. per 100 plants, as against 99·2 from the same number of sound ones, the corresponding figures for Fram being 31·1 and 80·4, respectively. On the other hand, the losses caused by mixtures of X+A and X+Y are considerably smaller, Erdgold affected by the former (expressed as severe mosaic), for instance, yielding 84 kg. per 100 plants as compared with 104·7 from the healthy control as mentioned above.

Since the losses from virus infections tend to become progressively heavier, plant-breeders are obviously concerned to propagate exclusively from virus-free strains, and for this purpose inoculations with the proposed selections must be made on an indicator plant. Chilli (*Capsicum annuum*) presents various practical advantages for the end in view, and served as an excellent indicator of the presence of the X virus, with or without admixtures of A and Y, even in infinitesimal amounts, so that, in addition to eye cuttings, the young sprouts and the tuber may be used as sources of inoculum. It is not, however, altogether reliable as a test plant for the Y virus, and the outcome of inoculations with A was negative, these results being in contradiction to those obtained by [I. C.] Kovačevski in Bulgaria (in litt.). The use of Samson tobacco as a test plant for A or Y is therefore required if it is desired to ascertain whether these viruses are absent [cf. ibid., xviii, p. 472].

Attempts to transmit the X and Y viruses from diseased chilli plants to their progeny by way of the seed were unsuccessful.

Ellenby (C.). **Trace-elements and 'Potato-sickness'.**—*Nature, Lond.*, cxlix, 3767, p. 50, 1 graph, 1942.

The results of a small-scale field experiment carried out during 1941 showed that the mean height of potato plants grown in soil infested with the eelworm *Heterodera schachtii* (which is considered not to be the sole cause of the disease known as 'potato sickness'), was considerably higher in the series watered with dilute solutions each containing minute amounts of a salt of one of various trace elements, than in the untreated series, the differences being most marked where the most dilute solutions were used. Thus, although the total quantity of zinc supplied to each plant treated with zinc sulphate throughout the season amounted to only 0·05 mg., the mean height of plants watered with the most dilute zinc sulphate solution was 40 per cent. greater than that of untreated plants. Similar effects were observed in the case of boric acid (total quantity supplied 0·5 mg.) and, to a lesser degree, in that of manganese chloride. Parts of the plot receiving the stronger solutions of trace elements exhibited generally a considerably greater mean height of plants, but the percentage differences between treated and untreated rows were not so large. It is considered probable that, under the conditions of this experiment, the treatments spread to the adjacent untreated rows and that that tendency was greater the stronger the solution used.

McKay (R.) & Clinch (Phyllis). **Freezing injury to Potato tubers.**—*J. Dep. Agric. Éire*, xxxviii, 2, pp. 367-373, 5 figs., 1941.

Unusually severe cold during the winters of 1938 to 1940 is stated to have caused considerable injury to potatoes in Eire, both in storage and transit. The following types of injury were observed in potatoes stored for experimental purposes at Glasnevin. Soft tubers with either total or partial softening of tissue exuding a sticky liquid when pressed and having blackened eyes and lenticels encircled by black areas represent the extreme form of injury and the affected tubers are completely killed. Firm tubers may have either (1) internal necrosis nearly always associated with the vascular tissue; (2) 'mealiness' followed by the collapse of dead cells, localized in any part of the tuber but most frequently in and within the region of the vascular ring; (3) killed eyes accompanied usually, but not always, by some visible internal injury; or (4) sunken areas usually about ½ in. in diameter.

In small-scale laboratory experiments with potato varieties Kerr's Pink, Up-to-Date, and Early Rose, a striking difference was observed in the resistance of individual tubers to low temperatures, but not of varieties. Exposure to 17° F. for 4 and 6 hours resulted in the milder types of injury, and for 18 hours in the most severe (soft tubers), while tubers exposed to 17° for 2 hours or to from 28° to 30° for 18 and 72 hours remained uninjured. When planted out, the affected tubers, according to the severity of the injury, may either soon become decayed by organisms of all kinds, fail to sprout if the eyes are dead, or fail to survive owing to weak sprouting. It is concluded, therefore, that frozen consignments should not be used for seed purposes. When freezing is suspected, sample tubers should be cut across at the heel and examined for internal symptoms. During prolonged cold spells in

winter pitted potatoes can be adequately protected by increasing the depth of the covering soil and by lining the latter with straw; in the case of potatoes stored in sheds, a lamp should be used to keep up the temperature to 30°.

Pfältzer (A.). **Vlugschrift der Centrale Proefstations-Vereeniging No. 1. Meeldauwbestrijding door zwavelbestuivingen.** [Leaflet No. 1 of the Central Experiment Stations Association. Mildew control by sulphur dusting.]—*Bergcultures*, xv, 44, pp. 1491–1492, 1941.

The following are the chief points to be borne in mind in the sulphur dust treatment of rubber mildew [*Oidium heveae*] in the Dutch East Indies [*R.A.M.*, xvii, p. 553]. A plantation covering some 600 ha. can be treated by means of a motor-duster, using either sulphur sludge or cirrus sulphur, the former a hygroscopic product containing 65 per cent. sulphur, which should be strewn out in a thin layer to dry, put through a sieve, and mixed with freshly slaked lime (one part to nine of the sludge) before use. Dusting is best carried out between 7 a.m. and 11 a.m., the first application being made when 20 per cent. of the trees in a group of 125 to 150 show fresh leaves or unfolding buds, and repeated every seven to eight days (one or two after heavy showers of rain) until 90 per cent. of the trees have put out new, stiff foliage. For each of the first three or four treatments 3 kg. cirrus or 4 kg. sludge per ha. should be used, the corresponding quantities for subsequent applications being 4 and 5 kg., respectively. Dusting should not be carried out in windy or wet weather. In very rainy districts the necessary repetition of the treatment every three or four days adds to the cost, and even then success is not assured; it is doubtful whether dusting can be regarded as profitable under such conditions. In nurseries dusting should be begun very early in the refoliation period and at least twice the ordinary number of applications are essential.

Kanivetz (I. I.) & Khariton (E. G.). Приготовление препарата гриба **(Trichoderma lignorum)** в целях заражения почвы. [Preparing soil inoculum of the fungus *Trichoderma lignorum*.]—*Научн. Зап. по Сахарн. Пром.* [*Sci. Notes Sug. Ind.*], *Kieff*, [Grey Ser.], xvi, 2–3, pp. 104–108, 1939.

On the basis of four years' study on the beneficial effect of *Trichoderma lignorum* [*T. viride*: *R.A.M.*, xx, p. 508] on the yield of sugar beet, the following practical method is proposed for the incorporation of the organism into the soil. Dry cake from the extracting press is scalded with boiling water, then cooled down to between 35° to 40° C. and inoculated with pure cultures of *T. viride* on 2 per cent. beet agar, diluted at the rate of 15 to 20 gm. culture to 2 l. water. It is estimated that 15 to 20 or, where available, even 40 kg. press cake can be applied to a 1 ha. field, 100 to 150 c.c. of the diluted pure culture being needed for the inoculation of 600 gm. dry press cake. The inoculated press cake, carefully covered with sterilized paper, is kept for four to six days at a temperature of 25° to 27°, till the surface of the mass is covered with dark green mats of spores. It is then thoroughly mixed with either sterilized peat or black soil to give a mixture for use at the rate of 2 to 3 z. [100 to 150 kg.] per ha. The mixture is either broadcast or placed

in rows on the soil or on the manure spread over the soil, and ploughed under the same day or early next day.

Positive results were obtained in laboratory tests when seeds of oats or winter wheat were inoculated with water suspensions of press cake containing *T. viride* (15 to 20 gm. pure culture per l. water per ha.), prepared immediately before inoculation, which can be carried out simultaneously with vernalization, or before sowing. Laboratory tests (and in the case of formalin field trials also) showed that *T. viride* survives treatment with various seed disinfectants such as preparation AB, Davidoff's, and formalin.

In the case of winter crops the mixture containing the organism should be incorporated at a depth of 5 to 6 cm. in rows between the rows of seeds.

Peele (T. C.) & Beale (O. W.). **Influence of microbial activity upon aggregation and erodibility of lateritic soils.**—*Proc. Soil Sci. Soc. Amer.*, v, pp. 33-35, 1940. [Abs. in *Chem. Abstr.*, xxxv, 20, p. 7089, 1941.]

Penicillium oxalicum and *Fusarium moniliforme* [*Gibberella fujikuroi*] were shown to promote the aggregation of Cecil clay loam soils under aseptic conditions. The inoculation of non-sterile soil after additions of sucrose or ground oats straw resulted in more extensive aggregation than in the uninoculated controls, while similar treatments in field plots decreased run-off and erosion and increased granulation.

Miller (J. H.), Grogan (R. G.), & Bowden (R. A.). **Diseases of medicinal herbs at the College of Agriculture, Athens, Georgia.**—*Plant Dis. Reptr*, xxv, 17, pp. 441–443, 1941. [Mimeographed.]

Plantings of medicinal herbs covering a total area of 24 acres were made at the College of Agriculture, Athens, Georgia, in 1941 to replace the European importations cut off by the war. The most important pathogen was *Bacterium solanacearum*, persisting in the soil of plots formerly occupied by its various hosts, including tomato and groundnut. The belladonna (*Atropa belladonna*) and henbane (*Hyoscyamus niger*) plantings were completely destroyed by the bacterial wilt, which also caused a minimum loss of 40 per cent. in an irrigated plot of Jimson weed (*Datura stramonium*), the same host in a drier situation being little affected by *Bact. solanacearum* but suffering almost complete defoliation by *Alternaria crassa* [*R.A.M.*, xiii, p. 597]. *Sclerotium rolfsii* was responsible for severe damage to *Carduus benedictus*, 30 per cent. of the plants wilting on an irrigated plot. *Rhizoctonia* [*Corticium*] *solani* caused 30 per cent. damping-off among dill (*Anethum graveolens*) and fennel (*Foeniculum vulgare*) seedlings in the greenhouse, while wilt (*Fusarium* sp.) attacked 10 per cent. of almost fully grown catnip plants (*Nepeta cataria*) and an unidentified crown rot killed 50 per cent. of the anise (*Pimpinella anisum*) stand.

MacMillan (H. G.). **Some diseases of drug plants and herbs observed in southern California.**—*Plant Dis. Reptr*, xxv, 17, pp. 443–445, 1941. [Mimeographed.]

Belladonna (*Atropa belladonna*), one of the drug plants grown on a

small scale in southern California in 1941 [cf. preceding and next abstracts], was attacked by *Rhizoctonia* (?) *solani* [*Corticium solani*], *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, i, p. 103], *Peronospora hyoscyami* [ibid., xvi, p. 65], and *Fusarium* sp., the two former causing damping-off and the two latter downy mildew and root rot, respectively. In the case of the last-named, bacteria were uniformly present in the externally sound tissues ahead of the fungal mycelium and were probably in part responsible for the decay. A species of *Fusarium* also caused complete disorganization of foxglove (*Digitalis purpurea*) roots, accompanied by gradual wilting and death of the plants.

Middleton (J. T.). **Some diseases of Belladonna in California and their control.**—*Plant Dis. Reptr*, xxv, 20, pp. 513–514, 1941. [Mimeographed.]

Belladonna (*Atropa belladonna*) roots, crowns, and stems in hillside plantings on heavy, poorly drained soils in California are infected by *Phytophthora parasitica*, the pathogenicity of which was established by inoculation experiments. The affected roots turn dark brown to black and become water-soaked and flaccid. Infection progresses upwards, often reaching the crown and stem. Diseased stems bear conspicuous, dark, slightly sunken areas, and under conditions of moderate to high temperatures and high relative humidity the basal leaves may also be attacked. The incidence of infection, which is liable to spread through an entire planting, may be considerably reduced by the discontinuance of overhead irrigation and the application of 2–2–50 Bordeaux mixture with a suitable wetter. Soil sterilization with chloropicrin has given excellent control of damping-off by *Pythium ultimum*, *P. de Baryanum*, and *P. irregulare*. The threatened destruction of the plantings by downy mildew (*Peronospora hyoscyami*) [see preceding abstract] was averted by thorough treatment with 0·5 per cent. lime-sulphur and 0·05 per cent. B. 1956 emulsifier, the results obtained with 2–2–50 Bordeaux and emulsifier being less satisfactory. Foliar diseases of no economic importance were caused by a species of *Alternaria* resembling *A. solani* and species of *Ramularia* and *Mycosphaerella*.

McMartin (A.). **Red rot in Co. 290 Cane.**—*S. Afr. Sug. J.*, xxv, 11, pp. 587, 589, 591, 3 figs., 1941.

In this paper, preceded by an introductory note by H. H. Dodds, Director of the South African Sugar Experiment Station, the writer reports the discovery on the Co. 290 sugar-cane variety in the Eshowe district of Natal of red rot (*Colletotrichum falcatum*), not hitherto recorded in South Africa, though believed to have long been present in the country in a relatively mild form on Uba. P.O.J. 2725, though not yet actually found infected, is also suspected of harbouring the fungus. Pending the development of resistant varieties (probably including Co. 281 and 301), growers are advised to restrict the spread of infection by the exclusive use of sound material for seed; the ploughing-out of badly diseased stands, which should be followed by a long fallow, with a green manure crop in the interval; and the burning of infected cane before cutting for the mill.

Snyder (W. C.) & Hansen (H. N.). **The species concept in Fusarium with reference to section Martiella.**—*Amer. J. Bot.*, xxviii. 9, pp. 738–742, 1941.

After expressing the view that the distinctions made by Wollenweber and Reinking for the separation of *Fusarium* species and varieties are too closely drawn to be of practical use, the authors adduce experimental data to demonstrate that the present system fails to provide a serviceable classification and nomenclature, particularly with reference to section *Martiella*.

All available members of the section were assembled, including the fungus described by Harter in 1938 as the cause of a pea root rot under the name *F. coeruleum* [*R.A.M.*, xvii, p. 787], Goss's *F. solani* var. *eumartii*, as well as the *F. solani* reported by him in 1940 as the cause of a potato stem rot [ibid., xix, p. 359], *F. solani*, *F. solani* var. *martii*, and its f. 1, *F. solani* var. *minus*, *F. solani* var. *striatum*, *F. javanicum*, and *F. aduncisporum*, made available by Wollenweber. In addition, the writers possessed a large assortment of isolates of most members of the section, representing widely separated geographical areas. The only one not studied was *F. javanicum* var. *ensiforme*.

Twenty single-spore cultures of each of nearly 100 isolates were made on potato dextrose agar and grown under identical conditions. Similar numbers of single spore cultures were made from these in turn. All culture transfers were made by means of single spores, and observations were made on numerous series of these cultures for nearly two years.

It early became apparent that macroscopic characters such as nature of aerial mycelium, kind and degree of pigmentation of spore masses, mycelium, or substrate, presence or absence of sclerotia or conidial fruiting structures, and colony configuration and growth rate, were entirely unreliable criteria for separation of the members of the section. Thus, certain Californian isolates of the following fungi, compared in pure culture under identical conditions, showed the same type of colony growth and dark blue pigmentation, and appeared (at sight) to be the same fungus: *F. solani*, saprophyte, from tomato, *F. solani* var. *martii* f. 2, parasite, from pea, *F. javanicum*, parasite, from vegetable marrow, and *F. coeruleum*, wound parasite, from a potato tuber. The fungus described by Harter in 1938 as a new root rot pathogen of pea, under the name *F. coeruleum*, was indistinguishable in appearance from the culture of *F. solani* var. *martii* (App. et Wr.) Wr. f. 2 Sny. listed above, and is probably a natural variant of it. Other isolates or variants of these same fungi had cream to light green spore masses and white mycelium, making it difficult, if not impossible, to distinguish them at sight from each other or from *F. solani* var. *eumartii* (Carp.) Wr., *F. solani* near *martii* f. 3 Sny., or from the *F. solani* described by Goss as the cause of a potato stem rot.

When hundreds of single ascospore cultures were made from perithecia of *Hypomyces ipomoeae* from squash, developed in pure culture by mixing single conidium cultures of field isolates, a striking array of cultural types was obtained. The range in pigmentation and in colony appearance shown by this single fungus was wider than the range of

cultural types exhibited by the combined collection of all other members of section *Martiella*, including those described by Wollenweber and Reinking.

Evidence of variability in measurements is cited from papers by a number of workers. Thus, Snyder (1934) has shown [ibid., xiv, p. 334] that average measurements of 3-septate conidia from the sporodochia produced in successive transfers of a single culture of *F. solani* var. *martii* f. 2 may be $30 \times 3{\cdot}9$, $35{\cdot}8 \times 4{\cdot}7$, or $44{\cdot}4 \times 5\,\mu$. Measurements of conidia from this fungus described by F. R. Jones under the name *F. martii* var. *pisi* [ibid., iv, p. 456] were given as 27 to 40 by 4 to $4{\cdot}5\,\mu$. The difference in average lengths reported by Snyder may, therefore, be $14\,\mu$, a difference greatly exceeding those now used to separate species. Even the average measurements of 3-septate conidia of a single spore culture of the same fungus, grown at the same time on different media varied (Snyder, 1934) from 35·8 by 4·7 to 41·2 by 4·7, a difference approximating to that between *F. coeruleum*, *F. solani*, and *F. javanicum*. Harter (1939, 1941) observed that *F. solani* var. *martii* f. 2, at one time may have abundant 3-septate but no 5-septate conidia, and at another time 14 per cent. of 5-septate conidia [ibid., xx, p. 597].

In a large single ascospore series from the squash isolate of *H. ipomoeae* wide differences were observed in the quantity of macroconidia produced, in size of conidia, in frequency of septation, and in spore shape. Chlamydospores and microconidia were produced in varying quantities by all cultures. Further, the range shown by these variations in microscopic, morphologic characters within this one fungus extended approximately across the range of characters used to distinguish the species and varieties of the section.

The authors propose to combine all the fungi in section *Martiella*, including the ascigerous forms, into a single species, the conidial stage of which is referred to *Fusarium solani* (Mart.) App. et Wr. emend., on the basis of morphologic characters. Five parasites of this section are classified as *formae* of the species, on the basis of pathogenicity alone, viz., *F. solani* f. *cucurbitae* n.f., *F. solani* f. *eumartii* (Carp.) n. comb., *F. solani* f. *phaseoli* (Burk.) n. comb., *F. solani* f. *pisi* (Jones) n. comb., and *F. solani* f. *radicicola* (Wr.) n. comb.

The two species, three varieties, and one form of the perfect representatives of this section are placed in the one species. The perfect stage of the fungus is *Hypomyces solani* Reinke & Berthold, which is emended to embrace all variants of the fungus hitherto given specific or varietal rank, namely *H. haematococcus* and its vars. *breviconus*, *caneri*, and *H. ipomoeae*, its f. 1 Wr., and its var. *major*. One form of this species, H. *solani* f. *cucurbitae* n.f. is erected for the ascigerous stage of the biologically specialized *F. solani* f. *cucurbitae*.

A synonymy is given relating the revised nomenclature to that of Wollenweber and Reinking.

Petrak (F.). **Mykologische Notizen. XIII.** [Mycological notes. XIII.] —*Ann. mycol., Berl.*, xxxviii, 2–4, pp. 181–267, 1940.

In this further series of critical annotations of fungi (851–930) [cf. *R.A.M.*, xiv, p. 124] the following are among the items presented. *Thyrospora* Kirschst. is relegated to synonymy with *Pleospora* [ibid.,

xvii, p. 841; cf. xx, p. 307]. *Encoelia kirschsteiniana* (Jaap) Kirschst. is regarded, on the basis of comparative spore measurements, as a synonym of *Phacidiella discolor* [ibid., xvi, p. 690]. It is apparent from the same author's description of *Phaeosphaerella berolinensis* on *Sorbus* [*Pyrus*] *aucuparia* that the fungus in question is none other than *Spilosticta inaequalis* (Cke) Petr. (syn. *Sphaerella inaequalis* Cke, *Venturia inaequalis* Wint. emend. Aderh.). Kirschstein's differentiation of *Spilosticta* from *Mycosphaerella* is also based on a misconception as regards the importance of setae. Actually these organs are neither numerous nor persistent in the former genus, and may indeed be altogether absent. The genus *Endostigme* Syd. is inseparable from *Spilosticta*. Similarly, *Phaeosphaerella macularis* (Fr.) Trav., which has not hitherto been recognized as a *Spilosticta* owing to the habitual absence of setae from the perithecial ostioles, must be transferred to this genus as *S. macularis* (Fr.) Petr. There is considered to be no doubt that this species is the ascigerous stage of *Fusicladium radiosum*, i.e., a form of *V. tremulae* [ibid., xix, p. 387] devoid of setae. The fungus known as *Phyllosticta viticola* [ibid., ix, p. 12] is shown by a critical examination to be a typical *Phyllostictina*, which should be designated *P. viticola* (Berk. & Curt.) Petr., with the following synonymy: *Septoria viticola* [loc. cit.], *Sacidium viticolum*, *Phyllosticta labruscae*, *P. vulpinae*, and *P. ampelopsidis*. *Rhopographus chorinensis* Kirschst. (*Ann. mycol., Berl.*, xxxvii, p. 117, 1939) is evidently identical with *Leptosphaeria coniothyrium*.

Jenkins (Anna E.) & Bitancourt (A. A.). **Revised descriptions of the genera Elsinoë and Sphaceloma.**—*Mycologia*, xxxiii, 3, pp. 338–340, 1941.

Revised descriptions, in English, are given of *Elsinoe* and its conidial stage *Sphaceloma*, pending the publication by the authors of a monograph on the two genera.

Bitancourt (A. A.) & Jenkins (Anna E.). **Treze novas espécies de 'Elsinoe' do Brasil.** [Thirteen new species of *Elsinoe* from Brazil.] —*Arq. Inst. biol. S. Paulo*, xii, 1, pp. 1–20, 17, pl. (1 col.), 1941. [English summary.]

Included in this critically annotated list, accompanied by technical descriptions, of 13 new species of *Elsinoe* collected in Brazil from 1936 to 1939 is *E. lepagei*, which forms on the leaves of *Achras sapota* irregular, raised, verruciform, rugose, well-defined, purplish-grey lesions, 0·5 to 2 mm. in diameter, and on the shoots numerous small, oval, slightly raised, rugose spots, 0·5 to 1 mm. in diameter. The fungus is characterized by fuscous, erumpent perithecia, 45 to 80 μ in diameter, round when viewed from above, pulvinate to hemispherical in transverse section; globose to obpiriform, biseriate asci, 16 to 22 by 12 to 21 μ; and hyaline, triseptate ascospores, slightly constricted at the median septum, 10 to 16 by 4 to 7 μ. On potato dextrose agar it produces compact, convoluted, cinnamon-buff colonies covered with white 'down' and surrounded by a viscous marginal zone.

Viennot-Bourgin (G.) & Saccas (A.). **Morphose cladosporioide chez Fusicladium pirinum.** [Cladosporioid morphosis in *Fusicladium pirinum*.]—*C.R. Acad. Sci., Paris*, ccxiii, 20, pp. 701–704, 1941.

Living tissues of pear, apple, and peach infected, respectively, by *Fusicladium pirinum* [*Venturia pirina*], *F. dendriticum* [*V. inaequalis*], and *Cladosporium carpophilum*, were maintained in a saturated atmosphere at 12° to 20° C. for 36 hours. The conidia of *V. inaequalis* were formed singly on each conidiophore, and were already germinating. The conidia of the other two species tended to form in short chains of two or three and the shape of each varied according to its position in the chain. This character is held by the authors to link the typical species of *Fusicladium* and *Cladosporium*.

Petrak (F.). **Beiträge zur Pilzflora der Umgebung von Wien.** [Contributions to the mycoflora of the environs of Vienna.]—*Ann. mycol., Berl.*, xxxviii, 2–4, pp. 339–386, 1940.

Included in this critically annotated list of fungi collected by the author in the environs of Vienna during 1939 is *Microthyriella rubi* [*R.A.M.*, xix, p. 291], observed on dry raspberry canes.

Godoy (E. F.) & Delle Coste (A.). **El 'mildew' del Tabaco en la región tabacalera de Salta.** [Tobacco 'mildew' in the Salta Tobacco-growing region.]—*Rev. argent. Agron.*, vii, 3, pp. 221–227, 4 figs., 1940. [English summary.]

In the spring of 1939 an epidemic of tobacco downy mildew, involving the Virginia, Burley, and Criollo varieties, occurred in the provinces of Salta and Jujuy, Argentina, where heavy losses were sustained in the seed-beds, many in fact being totally destroyed. The causal organism was tentatively attributed by J. C. Lindquist to *Peronospora nicotianae* [*R.A.M.*, xvi, p. 65], which differs from *P. tabacina*, the agent of a similar disease in Australia, the United States, and Brazil, in its more slender conidiophores (260 to 400 μ in length, mean 350 μ) and smaller conidia (15 to 24·5 by 12 to 16, mean 21 by 14·5 μ). The fungus, which was last observed in the Argentine by Spegazzini in 1902 on *Nicotiana alpina*, produced on the leaves yellow to chestnut-coloured lesions with irregular margins, spreading from the tip downwards, tending to converge and assuming a bluish cast on the under side, where the fructifications develop in profusion; at 15 to 20 days old the seedlings present a scorched aspect and collapse.

Thung (T. H.). **Waarnemingen over resistentie-eigenschappen bij verschillende Tabakssoorten.** [Observations on resistance properties of various Tobacco varieties.]—*Landbouw*, xvi, pp. 646–652, 1940.

In experiments at the Java Phytopathological Institute to determine the reactions to *Phytophthora* [*parasitica* var. *nicotianae*] of a number of selected tobacco varieties [*R.A.M.*, xvii, p. 490] two methods were adopted, one involving the cultivation of seedlings in trays filled with contaminated soil, and the other the inoculation of the leaves of mature plants by two hours' exposure to a constant stream of an aqueous suspension of infested soil. Tested by both methods, Hickory Pryor and

Joyner were the most resistant of the Virginia selections, while among other types Timor was much more susceptible than Djepoen; of the Rembang strains, Nos. 58 and 78 (Bkl 1 and Br 1) were the most resistant in trays and No. 80 (Br 3) in the leaf test, indicating variations between the reactions of the root and foliar systems. A number of crosses have been made in the hope of developing a new cigarette tobacco combining resistance to *P. parasitica* var. *nicotianae* with vigorous growth and other desirable characters.

The average percentages (by field counts) of slime disease [*Bacterium solanacearum*] among the Virginia, Rembang, and miscellaneous groups were 62, 35, and 38 per cent., respectively, the most susceptible in each being Gold Dollar (No. 41), Pr 1 (No. 88), and Koegopo A and B (No. 172), respectively, and the most resistant Cash (No. 40), Semboeng Cantjoer (No. 162), and Kastoeri (No. 176), respectively.

Clayton (E. E.) & McKinney (H. H.). **Resistance to the common mosaic disease of Tobacco.**—*Phytopathology*, xxxi, 12, pp. 1140–1142, 1 fig., 1941.

In 1939 and 1940 field tests were conducted at the Bureau of Plant Industry, Washington, D.C., to determine the relative merits of the so-called Ambalema and *Nicotiana glutinosa* types of resistance to tobacco mosaic [*R.A.M.*, xvii, p. 629; xviii, p. 62]. Genotypes with the *glutinosa* resistance, when inoculated with the mosaic virus, rapidly developed profuse systemic necrosis, and many of the plants were killed [cf. ibid., xxi, p. 51]. Such genotypes would logically be regarded as much more susceptible than ordinary tobacco, especially at the high temperatures prevailing during the summer in the major tobacco-growing areas of the United States. Many of the *glutinosa*-tobacco hybrids, moreover, succumb at a lower temperature, and over a wider age range, than the *glutinosa* parent. The widespread impression that the *glutinosa* reaction in tobacco is confined to the local lesion type of symptoms may be attributed to the performance of much of the breeding work under fairly cool greenhouse conditions. In contrast to the Ambalema type of resistance, established by six years of rigorous field trials, the prospects for the further development of *glutinosa* are not considered to be promising. Even more resistant than Ambalema is T.I. 448, one of the many collections with a similar type of reaction to the virus from Colombia [ibid., xviii, p. 629].

Holmes (F. O.). **A distinctive strain of Tobacco-mosaic virus from Plantago.**—*Phytopathology*, xxxi, 12, pp. 1089–1098, 2 figs., 1941.

Plants of rib grass (*Plantago lanceolata*) and broad-leaved plantain (*P. major*), growing as weeds near Princeton, New Jersey, were observed in the autumn of 1940 to show slight torsion of the petioles, chlorotic streaks along the veins, and systemic chlorotic mottling. A filterable virus was isolated from both hosts and inoculated into Turkish tobacco and *Nicotiana glutinosa*, on which necrotic lesions were formed, resembling those of tobacco ring spot on the former host and tobacco mosaic on the latter. The effects of the strains being apparently identical, that from rib grass was used in all further experiments. On *N. sylvestris* it induced the formation of dark brown, necrotic local lesions of the type

associated with the aucuba types of the tobacco mosaic virus. Tomato reacted to infection either by the development of inconspicuous localized lesions or occasionally by a spotty, chlorotic mottling. The rib grass strain of the virus formed only primary, mostly chlorotic lesions on *Physalis angulata*. Both bean (*Phaseolus vulgaris*) and cucumber were immune from infection.

Evidence that the rib grass virus is a strain of tobacco mosaic is afforded by its resistance to ten minutes' heating at 92° C. and to 122 days' desiccation at 23°, its infectiousness (tested on *N. glutinosa* leaves) at high dilutions (10^0 to 10^{-6}), its precipitation by the tobacco mosaic virus antiserum, its failure to produce typical necrotic primary lesions in tobacco and *N. sylvestris* tissues previously invaded by the tobacco mosaic virus proper, and its response to the genic constitution of tobacco. Differences from the type include adaptation to rib grass, the tendency to induce necrotic-ring effects in tobacco (the most important character), and inability to attack the bean. The new strain is designated *Marmor tabaci* var. *plantaginis* n. var.

TAKAHASHI (W. N.). **Changes in nitrogen and virus content of detached Tobacco leaves in darkness.**—*Phytopathology*, xxxi, 12, pp. 1117–1122, 1942.

During dark culture at the University of California the tendency of proteins to undergo hydrolysis in detached leaves of mosaic tobacco plants (i.e., those inoculated four weeks previously) and mosaic-inoculated foliage (inoculated immediately after detachment) did not differ from that of the proteins in healthy leaves. The virus multiplies in mature detached tobacco leaves [*R.A.M.*, vii, p. 409] stored in the dark with their petioles in distilled water, so that the process does not seem to demand meristematic cells or actively growing tissue, and is further compatible with a scarcity of proteins resultant on hydrolysis. Under the experimental conditions the living tobacco cell is incapable of utilizing tobacco mosaic virus protein in support of its respiration, being apparently devoid of any mechanism for the hydrolysis of this extraneous substance. The extract from trypsin-treated macerated infected tissues was more virulent in tests on *Nicotiana glutinosa* leaves than that from untreated tissues, probably owing to the disaggregation of the virus in the former material. The crystalline inclusion bodies in mosaic leaves do not function as reserve protein, nor are they drawn upon by the starving host tissues for assistance in respiration. Stream double refraction [ibid., xii, p. 525] is not destroyed in detached tobacco leaves by prolonged culture in the dark.

WOODS (M. W.) & DU BUY (H. G.). **Synthesis of Tobacco mosaic protein in relation to leaf chromoprotein and cell metabolism.**—*Phytopathology*, xxxi, 11, pp. 978–990, 1 fig., 1 diag., 1 graph, 1941.

The results of the investigation on tobacco mosaic virus protein in Turkish tobacco plants make clear that the synthesis of the virus protein is very like that of chromoprotein ('chlorophyll protein') and possibly from the same building units. The two processes are dependent on one respiratory enzyme system which is in its turn dependent on the nitrate nitrogen supply. This gives an explanation of the stopping of

virus multiplication when the nitrogen supply is low [*R.A.M.*, xx, p. 499]. The suggestion is made that the tobacco mosaic virus is an abnormal chondriosomal or chromoprotein material or has a relation to such substances.

Miller (G. L.) & Stanley (W. M.). **Derivatives of Tobacco mosaic virus. I. Acetyl and phenylureido virus.**—*J. biol. Chem.*, cxli, 3, pp. 905–920, 2 graphs, 1941.

Ultracentrifuge and electrophoretic measurements of acetyl and phenylureido derivatives of the tobacco mosaic virus indicated a homogeneity comparable to that of the unaltered virus. Determinations of specific virus activity, using the half-leaf method, on *Nicotiana glutinosa* and beans (*Phaseolus vulgaris*) showed that some 70 per cent. of the amino and 20 to 40 per cent., possibly more, of the phenol plus indole groups of the virus could be covered with either the acetyl or phenylureido groups without significant loss of activity, and it is inferred from the fact that normal virus was formed in Turkish tobacco plants inoculated with samples of the derivatives that these proportions of the amino and phenol group in the tobacco mosaic virus molecule are not concerned to any extent with the basic processes of virus reproduction.

Bremer (H.). **Das Blattrollen der Tomaten.** [The leaf roll of Tomatoes.] —*Phytopath. Z.*, xiii, 5, pp. 445–480, 15 figs., 1941.

A detailed, fully tabulated account is given of the writer's observations and experiments at the Biological Institute, Berlin-Dahlem, from 1929 to 1935, on tomato leaf roll [*R.A.M.*, v, p. 60], three forms of which are differentiated, viz., basal, total, and apical. In basal leaf roll the foliage is thick, brittle, and as it were 'stiffened', incapable of reverting to the normal expanded habit even under appropriate environmental conditions; in the total form of the disorder all leaves of the plant are affected as in the foregoing, except that young leaves in the upper part of the plant remain soft and pliable, while apical rolling is not accompanied by any other symptoms. The basal form is always irreversible and the total usually so, while in the apical form the foliage undergoes no fundamental structural alteration and may recover. The cause of basal leaf roll is an abnormal accumulation of organic matter in the leaves due to the cutting down of plants to the ordinary complement of one to three shoots. The development of the trouble may thus be obviated by the omission of cutting, while the removal of flowers or fruits intensifies the symptoms. Basal leaf roll is little, if at all, affected by rainfall or watering, but it is increased by strong illumination and reduced by shade. Total leaf roll is an advanced form of basal leaf roll. Apical leaf roll is the response of the plants to a shortage of water.

Tomato varieties fall into three groups in respect of their reaction to leaf roll, namely, non-rolling, medium-rolling, and rolling, the first being a heterogeneous collection, mostly of coarse- and broad-leaved, xeromorphous habit, in which a drooping of the pinnae towards the leaf axis takes the place of rolling; the second, comprising the best known heavy yielders, are mesomorphous types responding to cutting by basal leaf roll; while the third category is represented by plants of a

hygromorphous habit, giving poor yields under dry conditions, with thin, pointed leaves, markedly precocious, and tending to total rolling even without the stimulus of cutting. Representatives of the non-rolling group include Immune, Best of All, Stone, and Tuckswood, of the medium-rolling Augusta and Lucullus, and of the rolling President Garfield, Queen of the Earlies, and Beauty of Lorraine.

Other members of the Solanaceae suffering from leaf roll (besides potato) in Germany include *Solanum nigrum*, *S. pruniforme*, and *Lycopersicum humboldtii*.

WILSON (J. D.). **Disease control method for canning Tomatoes.**—*Canning Age*, xxiii, 1, pp. 47–49, 2 figs., 1942.

This is a summary of the writer's recommendations (noticed in part from other sources) for the control of tomato diseases, including early blight [*Alternaria solani*] and leaf spot (*Septoria*) [*lycopersici*] in northern Ohio [*R.A.M.*, xx, p. 181]. Three- to seven-row spraying or dusting machines have been found more practical than larger ones for the treatment of 3- to 10-acre fields. If the rows are planted 4½ to 5 ft. apart, the boom width should be adjusted to 22 to 25 ft., the upper limit for satisfactory performance and ease of handling. The critical period for infection by the above-mentioned fungi extends locally from 25th June to 1st September, during which time four or five applications of a copper-containing preparation should be given, the first between 25th June and 5th July and the rest at 12-day intervals. Dusting, though slightly less efficient in disease control than spraying, can be so much more conveniently and cheaply carried out that it is likely to come into general use. A standard spray formula may be stated as 4–4–100 (copper compound at 50 per cent. metallic plus flour and water), and that for a dust as 13–13–74 (copper, bentonite, and diluent), the liquid being applied at the rate of 100 to 250 gals. and the dry material at that of 25 to 40 lb. per acre.

SHAPOVALOV (M.). **Curly top control methods.** *Ex* **Solving Utah canning crop problems. Proceedings of the Fifth Annual School for Canning Crop Growers and Canners' Fieldmen, Ogden, Utah, 1941.**—[*Publ.*] *Utah agric. Coll. Ext. Serv.*, N.S., 109, pp. 24–25, 1941.

DORST (H. E.). **Reducing curly-top disease losses.**—loc. cit., pp. 25–26, 1941.

BLOOD (H. L.). **The curly-top breeding program.**— loc. cit., pp. 26–29, 1941.

In the first of these papers a full account is given of investigations on the relation of certain cultural practices, including modified spacing, to the incidence of tomato curly top in Utah, a note on which has already appeared [*R.A.M.*, xxi, p. 103 and next abstracts].

In the second paper the author states that the first migration of *Eutettix tenellus*, the vector of curly top, into the tomato-growing districts of northern Utah in 1940 occurred in late April and early May, and involved large numbers of leafhoppers from the southern part of the State and northern Arizona, which conveyed the virus to sugar beet and early-planted tomatoes, killing some 10 per cent. of the latter.

The second influx, consisting of leafhoppers from neighbouring breeding grounds in the north, took place between 20th May and 15th June, and resulted in the transmission of the virus to mid-season and late tomatoes, causing 75 per cent. of the total seasonal loss in these crops. The first symptoms of infection in early plantings appeared about three weeks after the entry of the insects into the fields, while the peak of the loss from the second influx was reached in 30 to 35 days. Some 35 per cent. of the exposed tomato plants under observation were killed by curly top in 1940, compared with only 2 per cent. in 1939. The incidence of infection was reduced in experiments during 1939 and 1940 by from 55 to 85 per cent. by protecting the plants with cheesecloth covers from the time of setting out until mid-June, while a substantial decline in mortality was also obtained by a double-hill planting system, in which a plant is set at each of two corners of the hole when the soil is broken by the shovel, the distance between the two plants being about 6 in. In a heavily infested area in 1940 the average percentage of survival at the end of the season ranged from 76 to 87·7 in double-hill plots, as against 24·9 to 29·2 in those with only one plant per hill, the cost of the additional plants being offset by the increased yield.

The third paper gives a tabulated account of nine years' breeding experiments undertaken with a view to the development of resistance to curly top in tomatoes Definite limitations to the success of the project through repeated selection among strains of *Lycopersicum esculentum*, wild or commercial, were indicated, while *L. pimpinellifolium* also gave disappointing results in the 1940 tests. On the other hand, 21 accessions of *L. peruvianum* and its varieties showed an average of only 16·31 per cent. infection, and one of *L. glandulosum* 12·8 per cent. in the same series of trials. Some of these accessions appear to be altogether immune from infection with 30 viruliferous insects at Logan, Utah.

WHIPPLE (O. C.). **Injury to Tomatoes by lightning.**—*Phytopathology*, xxxi, 11, pp. 1017–1022, 3 figs., 1941.

Lightning injury to field tomatoes is stated to be a frequent concomitant of electrical storms in south-eastern Wisconsin and northern Illinois, and among its symptoms (exclusive of complete prostration) are collapse of the stem and drooping of the tops; more or less extensive hollowing of the stem pith; collapse and desiccation of individual leaves of plants near the periphery of the striking area of the lightning; small longitudinal or circular stem lesions; irregular burnt areas on the stems, leaves, and fruits; and blistering of the fruit surface and partial or complete 'cooking' of the underlying tissue.

Dutch Elm disease in 1941.—*Plant Dis. Reptr*, xxv, 17, pp. 450–451, 1 map, 1941. [Mimeographed.]

A map, compiled from the weekly reports of the Bureau of Entomology and Plant Quarantine from 8th September, 1940, to 13th September, 1941, shows the spread of Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xxi, p. 104] in that period. New locations include Alford in Massachusetts (first report for the State), Preston in

Connecticut, Kiefer in Maryland, and Fort Ashby in West Virginia, and eight counties adjacent to the main infection area.

Weber (G. F.). **Leaf blister of Oaks.**—*Pr. Bull. Fla agric. Exp. Sta.* 558, 2 pp., 1941.

Taphrina coerulescens produces on the new foliage of various species of oaks [*R.A.M.*, viii, p. 405] in Florida small, circular (up to $\frac{1}{16}$ in. in diameter) or irregular ($\frac{1}{4}$ to $\frac{1}{2}$ in.) blisters of variable colour, predominantly blended shades of green, yellow, rose, and purple, the spores developing on the concave side of which impart, first a silver-grey sheen, and later a brownish, velvety appearance, to the surface. Large blisters, or those situated on the main veins, are apt to induce foliar curling and distortion of the narrow-leaved varieties. The exact mode of perpetuation of the fungus is not known, but infection is largely confined to the leaves developing in the early spring from the dormant buds and to those next produced on the new shoots. Direct control measures, as distinct from general sanitary precautions, are applicable only to small trees of particular value: fallen leaves should be removed from the vicinity and a standard fungicide, e.g., 4–4–50 Bordeaux mixture, sprayed over the buds a week or ten days before they begin to swell, followed if necessary by a second treatment before the full expansion of the foliage.

Yatsenko-Khmélévsky (A. A.) & Vassilevska (Lydie M.). **La réaction des cellules vivantes du bois de Hêtre abattu à la propagation du champignon.** [The reaction of the living cells of felled Beech wood to fungal propagation.]—*C. R. Acad. Sci. U.R.S.S.*, N.S., xxvi, 7, pp. 709–712, 1940.

In comparative experiments freshly cut beech blocks and similar blocks, killed with formaldehyde or alcohol and thoroughly washed, were placed on cultures of *Fomes igniarius* and incubated for 10 to 90 days in one test and for 20 to 120 days in another. Microchemical determinations were made (in both tests) of starch, sugar, and tannic materials; sections were stained with safranin and methylene blue, and the hyphae with aniline blue dissolved in lactic acid.

The data obtained showed that the presence of the fungus in the wood induced changes in the state of the plastic materials different from those observed in the wood after felling. In the killed wood infected by the fungus all the plastic materials gradually disappeared. The tannic materials and starch disappeared first, probably becoming changed into sugar, which itself became less in quantity towards the end of the experiment. The disappearance of starch and tannic substances coincided with the appearance of the first signs of the destruction of the cell walls. In some of the vessels in heavily infected wood the hyphae and their products were visible macroscopically as brownish spots and lines.

The introduction of the fungus into the untreated living wood in ten days changed all the plastic materials into a brownish liquid filling the whole cavity of the living cell and then accumulating in the cavities of the fibres and vessels. The infiltration of this liquid (provisionally referred to as 'mycoinfiltrate') into the walls imparted the brown colour to the living infected wood. The formation of the mycoinfiltrate

is considered to have resulted from the reaction of the living cells to the fungus. This substance was not observed in dead wood. Tyloses were formed only in infected wood and never in the sterile controls.

These results demonstrate that it is possible to distinguish infected wood from wood showing a traumatic reaction, and to determine, even in the absence of tyloses, from the state of the plastic substances whether infection has occurred in the living or dead wood.

Thirumalachar (M. J.). **Hapalophragmium ponderosum Syd. on Acacia leucophlaea Willd.**—*J. Indian bot. Soc.*, xx, 5–6, pp. 293–298, 1 pl., 4 figs., 1941.

The rust *Hapalophragmium ponderosum*, which has been observed to form on the branches, flowers, and pods of *Acacia leucophlaea* in the Bangalore district of India tumours closely resembling in anatomy and mode of development those of crown gall (*Bacterium tumefaciens*), is characterized by stipitate, tricellular, reddish-brown, persistent teleutospores giving rise without a resting period to oval, binucleate sporidia, 10 by 8 μ, germinating *in situ*. Hyaline or deep brown, oval, ostiolate, subepidermal pycnidia, containing masses of oval or spherical spores embedded in nectar, were detected for the first time both on young galls and on fresh excrescences from old ones. Hyperplasia, tumour strands, tracheids, and fusiform parenchymatous cells are among the features common to both the rust and bacterial galls under comparison. *A. leucophlaea* has further been recently observed to harbour another species of *Hapalographium*, *H. tandonii* Mitter.

Olson (A. J.). **A root disease of Jeffrey and Ponderosa Pine reproduction.**—*Phytopathology*, xxxi, 12, pp. 1063–1077, 3 figs., 1941.

From 1937 to 1940 the writer made observations and experiments on a disease causing an exudation of yellowish-white 'pitch' on the surface of the roots and root-collars of pines (*Pinus jeffreyi* and *P. ponderosa*) on the eastern slope of the Sierra Nevada, northern California. No external symptoms are shown in the early stages of infection, but as the malady progresses the normal colour of the needles fades to a paler, and ultimately to a whitish green. With the death of the trees the needles turn yellow, later brown, and are finally shed. The steles of affected roots are heavily infiltrated with 'pitch', some of the small roots becoming translucent because of the infiltration. The affected trees were consistently found in the vicinity of old stumps, from which infection evidently radiated by way of the roots. The age of the trees observed by the writer ranged from 5 to 17 years, but in 1934 Salman and Wright noticed cases of the disease in much older ones, measuring 14 to 16 in. in diameter at breast height. Little economic importance attaches to the disorder at the present time.

The fungus originally isolated by Wright and later by the author from infected material is named *Cunninghamella meineckella* n. sp., and is characterized by sparsely septate, ivory-coloured, later fuscous hyphae, 2·1 to 5·7 (mean 3·6) μ in diameter; erect simple, septate conidiophores, 57·5 to 402·5 by 4·8 to 7·9 (250 by 6) μ, with round heads, 9·3 to 21·2 (16·5) μ in diameter, and sterigmata 2·3 to 4·6 (2·5) μ in length; and hyaline, smooth-walled, obovate conidia, 4·5 to 7·2 by 5·3

to 11·1 (5·6 to 8) μ. The minimum, optimum, and maximum temperatures for the growth of the organism on potato dextrose agar were found to be 0·1°, 22° to 25°, and between 33·2° and 36·8° C. Inoculation experiments gave 100 per cent. successful results on the roots of 2½-year-old seedlings and on those of saplings in the woods; 1½-year-old seedlings developed the typical symptoms in two cases out of 20, but those up to one year old reacted negatively to the pathogen. Inoculations made by placing portions of roots on which *C. meineckella* had been cultured, in close contact with, but not fastened to, a healthy uninjured root of Jeffrey pines 4 to 10 ft. high, gave uniformly positive results, proving that the disease can be spread by root contact.

Day (W. R.). **Forest pathology.**—*Rep. Imp. For. Inst., Oxford, 1940–41*, pp. 11–13, 1941.

In this report [cf. *R.A.M.*, xix, p. 505] it is stated that in the areas surveyed by Oxford University working parties in connexion with emergency war felling of timber, butt rot was observed to be a commoner source of loss among conifers, particularly larch and spruce, than has hitherto been realized. Apparently, a tendency to develop extreme moisture conditions is correlated with a prevalence of butt rot, but the course of the events which accompany death and infection of the roots is not known. The chief agent of decay is *Fomes annosus* [cf. ibid., xviii, p. 827], with *Polyporus schweinitzii* [ibid., xx, pp. 328, 435] next in importance. There was some indication that the fungus concerned is able to attack the root and kill it only in certain limited soil layers. Acute lime-induced chlorosis was observed in Japanese and hybrid larch; the more severely affected trees were found on sites that allowed only shallow root penetration, owing to the presence of a bed of re-cemented chalk rubble in the subsoil. Chlorotic European larches reacted to injection tests.

Further observations on European larch die-back [ibid., xix, p. 179] indicated that it occurs at high elevations (in relation to the surrounding topography), in situations where severe frosts are experienced, in exposed places (especially those looking east), in ravines, and in certain soil profile types (e.g., a fairly shallow, freely draining loam over excessively drained fissured hard rock); nutrient deficiencies may, possibly, conduce to susceptibility, and seed provenance is unquestionably important, though seed unsuccessful in one locality may prove successful elsewhere.

Owing to the cool, wet summer, elm disease [*Ceratostomella ulmi*: ibid., xix, p. 172] was less prevalent and milder in 1941 than in 1940.

Andrews (S. R.) & Gill (L. S.). **Western red rot control for the Black Hills.**—*J. For.*, xxxix, 10, pp. 818–823, 2 figs., 1 graph, 1941.

The outcome of a survey involving the examination of all dead branches pruned from 1,582 pine (*Pinus ponderosa*) trees on 26 plots in the Black Hills of South Dakota for the presence of western red rot (*Polyporus ellisianus*) [*R.A.M.*, xix, p. 310] (the examination being restricted to branches below 17 ft.) indicated that the incidence of infection in first logs is concentrated in the so-called large-branched trees having one or more dead branches with a basal diameter exceeding 1·5 in. below a height of 17 ft. In thinned stands infection increased

from 5 per cent. in the 41 to 60 year to 10 per cent. in the 61 to 80 year age class, while the average incidence of the rot in 81- to 120-year-old unthinned stands was 27 per cent., denoting a rapid increase above the age of 80. The maximum infection observed to originate below a height of 17 ft. under natural conditions was about 33 per cent. Generally speaking, the incidence of infection increased directly with d.b.h. In thinned stands the amount of decay in the 8 to 9 in. d.b.h. trees was about four times that occurring in the 4 to 5 in. class. In the same stands 22 and 31 per cent. of the trees with large dead branches were infected in the 41- to 60- and 61- to 80-year age classes, respectively, compared with only 4 and 7 per cent., respectively, of those with small dead ones.

Where stand improvement operations are under consideration, a considerable reduction in the eventual loss from decay may be effected in stands up to 80 years where the predominating diameters exceed 6 in. by pruning only small-branched trees as crop trees. Thinning in dense young stands tends to increase the average branch size and thereby to promote the likelihood of western red rot infection. No heart rot was found in dissected trees under 80 years old, whereas 33 per cent. of those about 140 showed an average of 7 linear ft. of decay in the butt log.

RABANUS (A.). **The laboratory testing of wood preservatives. The behavior of wood treated with copper sulfate.**—*Holz Roh- u. Werkstoff*, iii, pp. 233–238, 1940. [German. Abs. in *Chem. Abstr.*, xxxv, 5, p. 1596, 1941.]

In wood treated with water by the Boucherie process [*R.A.M.*, xx, p. 506], the loss of weight in test blocks due to controlled decay is about the same as in the untreated check samples, showing that the influence of nutrient materials in the sap is negligible. The amount of copper sulphate required to protect wood against different fungi varies greatly. Leaching tests support the claim frequently advanced that some of the copper is fixed in the wood, and the formation in the latter of copper carbonate is assumed. In culture media malachite and cuprous oxide are equally toxic with copper sulphate to five wood-destroying fungi, but much less so to seven others. Small test blocks, treated first with copper sulphate and then after drying, with sodium carbonate, resisted the attacks of three fungi, but succumbed to those of another three. The copper is leached more rapidly from poles set in soils containing an abundance of decaying nitrogenous matter, but otherwise the nature of the soil is of slight importance, the inconsistency of the results of copper sulphate impregnation being due to the distribution of the various fungi concerned in the rotting of the wood.

GEWECKE (H.). **Absorption of (wood-) treating solutions and completeness of treatment in sap-displacement processes with modern salt mixtures.**—*Holz Roh- u. Werkstoff*, iii, pp. 321–325, 1940. [German. Abs. in *Chem. Abstr.*, xxxv, 5, p. 1597, 1941.]

In the treatment of telephone poles with arsenate-chromate-fluoride salts [cf. *R.A.M.*, xxi, p. 107] by the Boucherie process [see preceding abstract], the amount of chemical introduced is 10 to 15 times that required to inhibit decay. A simple method of estimating the probable response to treatment of any wood by means of small test pieces is described.

Cohen (S. I.) & Heald (F. D.). **A wilt and foot rot of Asparagus caused by Fusarium oxysporum Schlecht.**—*Plant Dis. Reptr*, xxv, 20, pp. 503–509, 1941. [Mimeographed.]

Fusarium oxysporum was isolated from the tissues of asparagus in many of the irrigated sandy soils of Washington, where the crop has recently been observed to suffer from a wilt and foot rot believed to be identical with the disease reported by M. T. Cook from New Jersey in 1923 under the name of 'dwarf' [*R.A.M.*, iii, p. 73]. The trouble appears to be widespread in the United States, being more destructive than rust [*Puccinia asparagi*] in New York and Massachusetts, where 5 to 10 per cent. of the stands are commonly affected. In the lower Yakima Valley, Washington, the incidence of crown infection ranges from 25 to 50 per cent. The symptoms include a red or reddish-brown discoloration of the tissues, sometimes extending 2 ft. upwards into the stem, depressions and cracks in the stem bases, a yellow streaking of the shoots, a red discoloration of the shell, desiccation of the roots, and complete cortical disintegration by secondary invaders. One symptom of infection is represented by a sudden wilting of the young shoots before cladophyll production, while yet another aspect is revealed by the inspection of young plantings, in which the shoots are frequently girdled at soil-level by elliptical red-brown lesions, the fungus being present in the red-streaked tissues of the white outer stems.

All the symptoms detected on asparagus in nature were induced in greenhouse inoculation experiments at 20° to 29° C., the incubation period being shorter in sandy than in silt loam soils. High temperatures likewise favour the development of the pathogen, which penetrates uninjured tissues as easily as wounded ones. The underground rootstock of asparagus differentiates root and stem meristems at its apices. As the current year's organs die, the fungus penetrates them and lives saprophytically during the winter and spring, but vigorously attacks the living portions of the host in the warm summer periods. Isolates of the fungus from supposedly healthy five-year-old crowns from South Carolina and California also caused typical infection. The asparagus strain of *F. oxysporum* differs from others already described in its failure to attack potatoes, tomatoes, and carnations at 20° to 22°, and potato tubers and onion bulbs at 25°. All commercial varieties of asparagus appear to be equally susceptible, the ornamental *Asparagus plumosus* is subject to infection in the greenhouse, and the fungus further causes a slight wilt of Alaska peas of which the symptoms resemble 'near wilt' [*F. oxysporum* f. 8: ibid., xviii, p. 777]. Two cases of seedling wilt caused by the fungus were reported from widely different regions. Infected root stems and crowns showed the presence of hyphae of the fungus in the tracheae, xylem parenchyma, phloem, and cortical parenchyma. Necrosis [cf. ibid., ii, p. 521; xiv, p. 323] of the parenchyma cells far in advance of the hyphae indicated the presence of a toxic secretion by the fungus.

Experimental treatments with various fertilizers did not appreciably mitigate the severity of the disease, the sole practicable measure for the control of which probably lies in the development of a hybridization programme initiated from naturally resistant species or strains of asparagus.

Mouravieff (V. P.). Пероноспороз Свеклы. [Peronosporosis of Beet.] —*Научн. зап. по Сахарн. Пром.* [*Sci. Notes Sug. Ind.*], *Kieff*, [Grey Ser.], xvi, 2–3, pp. 62–75, 6 figs., 1939.

The distribution and intensity of *Peronospora schachtii* [*R.A.M.*, xx, p. 333] infection on sugar beet, which until recently was of rare occurrence in the Soviet Union, is stated to have strikingly increased during 1937–8. The disease spread to several districts on the right and left banks of the river Dnieper, affecting up to 7 per cent. of plants in some fields. The late summer (August–September) sowings proved to be the most susceptible to infection, which is easily explained by the fact that the development of the seedlings from these sowings takes place mainly in cool and moist weather, most favourable for the development of the fungus. It is stated that as yet no satisfactory method exists for the treatment of mother roots before transplanting or for diagnosing the presence of disease in them. For the control of the disease all diseased roots should be destroyed at lifting, and all diseased plants detected at periodical inspections of the growing crop removed and the surrounding soil sprayed with 1 per cent. Bordeaux mixture over a radius of 15 to 20 m.

Tolman (B.) & Stoker (G. L.). **Sulfur and nitrogen deficiency relationships in Sugar Beets grown for seed in Oregon.**—*J. Amer. Soc. Agron.*, xxxiii, 12, pp. 1072–1079, 4 figs., 1941.

Both nitrogen and sulphur deficiencies were conspicuously in evidence on sugar beets grown for seed in the Willamette Valley, Oregon, in 1939, the former manifested by retarded, spindly growth, chlorosis, and a reduction in the number of plants entering into seed production, and the latter by similar abnormalities of growth and colour with the addition of breakdown of the foliar tissue, increased susceptibility to infection by *Ramularia beticola* [*R.A.M.*, xxi, p. 121], and the development of a vegetative condition of the seed heads in place of normal flowering. Sulphur and nitrogen interacted strongly both on plant development and seed production, the former exerting no effect on yield in the absence of the latter, while the response to nitrogen was much more apparent in the presence of sulphur. Applications of both elements will obviously be necessary in commercial sugar beet production in the region under observation, probably in excess of 125 lb. per acre in the case of nitrogen, to judge from the outcome of preliminary tests.

Weber (G. F.). **Bacterial spot of Peppers.**—*Pr. Bull. Fla agric. Exp. Sta.*, 549, 2 pp., 1940.

A popular note is given on bacterial spot of chilli (*Phytomonas vesicatorium*) [*Xanthomonas vesicatoria*] in Florida, where heavy losses, especially on the sweet or mild varieties [*R.A.M.*, xix, p. 451], have been caused by the disease on several occasions since its first detection in the State in 1916. Control measures should include judicious crop rotation, excluding from the immediate sequence tomatoes, the only other local host of the pathogen; disinfection by immersion for five to seven minutes in 1 in 1,000 mercuric chloride or a normal solution of organic mercury, or by dusting with mercury or red copper oxide; the

application to the soil of the seed-bed, as the seedlings are emerging, of a normal organic mercury solution sufficient to wet the ground for a depth of ½ in.; the spraying of the whole bed, when the seedlings have put out two or three leaves, with 1–2–50 Bordeaux mixture or red copper oxide, or dusting with copper-lime; and the weekly treatment of infected plants in the field with 4–4–50 Bordeaux mixture.

WEBER (G. F.). **Cowpea scab.**—*Pr. Bull. Fla agric. Exp. Sta.* 557, 2 pp., 1941.

Cowpea scab (*Cladosporium vignae*) [*R.A.M.*, x, p. 82] has been found to be more severe in Florida on spring than on summer or autumn plantings. The symptoms of the disease and the life-history of the pathogen are described [ibid., v, p. 76]. The fungus survives from the harvest to the next season's planting time on the seed coat or in the cotyledons. Primary infection resulting from this source is seldom very conspicuous unless a high percentage of the seed contracts the disease and weather conditions favour its development. The foliar and young stem lesions may also be easily overlooked, so that secondary infection is liable to develop before flowering. A diagnosis of scab may be based on curved or coiled pods bearing large, slightly raised, cracked, brown to tan, corky lesions, with irregular margins.

In addition to the use of healthy seed (which cannot be guaranteed until certified material is placed on the market) and a definite scheme of rotation, control measures should include the application, at ten-day intervals from the seedling stage to flowering, of 2–2–50 Bordeaux mixture or 20–80 copper-lime dust at the rate of 10 to 25 lb. per acre for each treatment. In recent experiments on the reaction to *C. vignae* of 30 cowpea varieties, the otherwise desirable fresh-vegetable types, such as Ramshorn, California, Extra Early, and strains of Blackeye, proved highly susceptible and produced few or no marketable pods or seeds. The early varieties, e.g., Blue Goose, Black Crowder, Purple Hull, and Purple Hull Crowder, remained free from infection during the season, as also did the mid-season and late Brabham, Clay, Cream Crowder, Iron, Lady Finger, and Whippoorwill, the latter group, however, setting a light crop of pods; Bunch Conch and Cream Lady were usually attacked.

ZAUMEYER (W. J.). **Reaction of Pea varieties to Septoria pisi.**—*Phytopathology*, xxxii, 1, pp. 64–70, 1942.

Of the 134 pea varieties and strains inoculated with *Septoria pisi* [*R.A.M.*, xix, p. 601; xx, pp. 211, 450] in the field in Colorado from 1936 to 1939, only two exhibited a very high degree of tolerance in respect of the leaf spot, viz., one strain of Perfection and an unnamed import from Puerto Rico. Of the canning varieties, 20 were moderately, 22 severely, and 7 mildly infected, the last-named being mostly of the Perfection type, with disease indices ranging from 1·1±0·18 to 2·2± 0·36 (1 to 2, 2 to 3, 3 to 4, and 4 to 4+ representing mild, moderate, severe, and very severe infection, respectively), while Canners Delight (1·4±0·19), Rogers Delicious (1·6±0·19) and Rogers Famous (1·9± 0·19) were also fairly resistant. Only Rogers No. 95 of the market-

garden varieties showed mild infection (1·9±0·19). None of the edible podded varieties was highly tolerant, but only one, Mammoth Pod Early, was extremely susceptible (4·2±0·27). Besides the above-mentioned Puerto Rican strain (1·1±0·19), two other field varieties, Black Eye Marrowfat and Blue Prussian, showed only mild infection (1·6±0·36 and 1·8±0·43, respectively).

Costa (A. S.) & De Souza (O. F.). **Nota sôbre a verrugose do Amendoinzeiro.** [Note on Groundnut scab.]—*Biológico*, vii, 12, pp. 347–349, 2 figs., 1941.

During the season of 1938–9 groundnut scab (*Sphaceloma arachidis*) occurred in a severe form at the Central Experiment Station of the Agronomic Institute, Campinas, São Paulo, Brazil [*R.A.M.*, xx, p. 427], subsequent attacks in the next two years being of a milder character. The incidence of infection on 38 varieties (designated by numbers only) in the first year of observation ranged from nil in No. 44 (possibly a species of *Arachis* distinct from *A. hypogaea*) to 4·1 (5 representing extensive foliar spotting) in No. 45, satisfactory resistance being shown by Nos. 2, 4, 9, 15, and 31, with ratings of 0·8, 0·4, 0·6, 0·8, and 0·6, respectively.

Retter (G. R.). **The cultivation of Mushrooms.**—*J. N.Y. bot. Gdn*, xliii, 505, pp. 8–14, 6 figs., 1942.

The writer gives an outline of the principles underlying the successful cultivation of mushrooms (*Psalliota campestris*) in the United States, where the annual output is stated to exceed 40,000,000 lb., and of the methods of application to be adopted, but for fuller information intending growers are referred to the 'Manual of Mushroom Culture' of the Chester County Mushroom Laboratories or to *Bull. U.S. Dep. Agric.* 1875 [*R.A.M.*, xx, p. 621].

Jenkins (W. A.). **Angular leaf spot of Muscadines, caused by Mycosphaerella angulata n.sp.** — *Phytopathology*, xxxii, 1, pp. 71–80, 2 figs., 1942.

Attention has already been drawn to a muscadine grape (*Vitis rotundifolia*) disease in Georgia caused by a fungus previously known as *Cercospora brachypus* [*R.A.M.*, xxi, p. 64] but herein designated by a name appropriate to the newly discovered perfect stage, viz., *Mycosphaerella angulata* n.sp. This phase of the fungus may be observed on recently fallen leaves, maturing throughout the period from October to the end of February, and consists of amphigenous, ovate to subglobose, semi-immersed, black perithecia, beaked before maturity, later provided with a papillate ostiole, 40 to 90 by 40 to 60 μ; and cylindrical-clavate, short-stipitate, fasciculate, aparaphysate, bitunicate asci, 36·4 to 42 by 8·4 to 14 μ, each containing one to two rows (the second imperfect) of bicellular, straight or slightly curved, hyaline, guttulate spores, 14 to 19·6 by 2·8 to 5·6 (average 16·8 by 4) μ. The pathogen causes the development on the living foliage of angular, necrotic, dark brown to black lesions, up to several cm. in diameter, distinctly areolate on the upper surface, and bearing the conidial stage characterized by fasciculate to lax, geniculate, short, continuous to

pluriseptate, hyaline or pale olive-grey conidiophores, arising from a stromatic base, and subhyaline, cylindrical, curved, very slender, uni- to quinqueseptate, guttulate conidia, pointed at both ends, 16·8 to 112 by 2·2 to 3·5 (47·6 to 72 by 2·8 to 3·5) μ. Ovate to globose, black spermogonia, 30 to 60 by 30 to 50 μ, are scattered in and along the margins of conidial lesions and produce small, rod-shaped, hyaline spermatia, 2 to 4 by 0·5 to 0·7 μ, arising endogenously, usually in fours, and liberated through sterigma-like processes.

The leaf spot, which is believed to be co-extensive with muscadine culture in the south-east, having originally been reported from Alabama (*J. Mycol.*, viii, pp. 62–73, 1902), is in general more prevalent on superior introductions, such as Hunt, Yuga, Creek, Stuckey, and Howard, than on the older varieties, Scuppernong, Flowers, and Thomas. From one season's experience it appears to be controllable by fortnightly applications of 4–5–50 Bordeaux mixture, the first so timed as to precede the initial heavy ascospore discharge in the spring and the treatment continuing during the next four to six weeks. Other possibilities of control lie in stringent vineyard sanitation and the careful selection of breeding stock.

Reinboth (G.). **Die Einsparung von Kupfer bei Pflanzenschutzmitteln in Italien.** [The saving of copper in plant protectives in Italy.]—*Z. PflKrankh.*, li, pp. 441–442, 1941. [Abs. in *Chem. Zbl.*, cxii (ii), 22, p. 2724, 1941.]

Citrus oils and mercury compounds proved ineffectual for the control of [vine] *Peronospora* [*Plasmopara viticola*] in Italy, but excellent results were secured with the 'Casale' Bordeaux mixture and cuprital (utilizing only 0·5 to 0·8 per cent. copper [cf. *R.A.M.*, xvii, p. 583] and consisting of a mixture of 40 per cent. copper sulphate, iron, aluminium, and dipotassium monoxide salts and ammonium compounds).

Service and regulatory announcements July–September, 1941.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 148, pp. 80, 82, 1941.

Uruguay. Decree No. 50 of 4th June, 1941, introduces certain modifications into the Decree of 10th January, 1934, respecting the importation of seed potatoes [*R.A.M.*, xiii, p. 672], all consignments of which must be accompanied by certificates guaranteeing the virtual freedom of the places of origin from *Synchytrium endobioticum* and *Spongospora subterranea*, and the absence from the tubers of other serious parasitic diseases. The presence of powdery scab (*S. subterranea*) entails rejection, the presence of black scab (*Rhizoctonia violacea*) [*Helicobasidium purpureum*: ibid., ix, p. 554] necessitates previous disinfection; while common scab (*Actinomyces scabies*) is permitted to a maximum of 5 per cent. of the tubers and 10 per cent. of the surface.

S. Africa. Under Proclamations Nos. 65 and 87 of 1941, Proclamation No. 286 of 1936, relating to the exclusion of bacterial canker of tomato (*Aplanobacter michiganense*) [ibid., xvi, p. 640] is amended to necessitate the accompaniment of tomato seeds from Germany, Italy, North America, or any other country in which the disease occurs, by an import permit and certificate stating that the seed was produced by plants free from the disease.